HAZARDOUS SUBSTANCES PROGRAMME

HAZARDOUS SUBSTANCES LIST AND HANDBOOK

REPORT NUMBER ARB-TDA-33-76 (REVISED)

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The Honourable
George A. Kerr, Q.C.,
Minister

Everett Biggs,
Deputy Minister

Ministry of the Environment
Ontario

AIR RESOURCES BRANCH
TECHNOLOGY DEVELOPMENT & APPRAISAL SECTION
REPORT NUMBER ARB-TDA-33-76 (Revised)

AIR RESOURCES BRANCH HAZARDOUS SUBSTANCES PROGRAMME: HAZARDOUS SUBSTANCES LIST AND HANDBOOK

Ministry of the Environment
Air Resources Branch
880 Bay Street
Toronto, Ontario.

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01. SUMMARY

Briefly stated, the objective of the Air Resources Branch's Hazardous Substances Programme (HASP) is to increase the efficiency and sensitivity of the Ministry's response to real, rather than conjectured pollution problems. A key intermediate stage in attaining this objective is the determination of a detailed, province-wide inventory for a select group of substances which are used in significant quantities in Ontario and which have high acute or chronic toxicity. This is the main subject of this report. The report also summarizes the history of the HASP programme and the nature and course of its future stages.

The select substances on which inventory data are required constitute the Hazardous Substances List (HASL). The rationale, scope, and description of this list are given in section 03. of the report. The list itself is given in the Hazardous Substances Handbook which is section 05.of the report. In view of the fact that the inventory data collection requires intimate knowledge of industries (type and distribution) on a Regional scale, it is obvious that the inventory information could only be provided reliably and efficiently by regional personnel. Accordingly, sections 03 and 04 of the report suggest procedures by which the inventory can be obtained. The Hazardous Substances Handbook (section 05), which constitutes the bulk of the report, provides background information to assist in collecting inventory data and most importantly, to assist in estimating actual emissions.

The inventory data will be used to identify a small number of high priority substances on which to concentrate the resources and efforts of the Ministry of the Environment. Thus, the main responsibility of the Technology Development

and Appraisal Section of the Air Resources Branch will be to collect and process all relevant information, including the inventory data, and to compile the priority list. A discussion of this priority-setting process is given in section 04 of the report.

02. INTRODUCTION

The total number of industrial chemicals to which the general population of Ontario may be exposed is enormous. According to a recent compilation prepared for the Air Resources Branch by James F. MacLaren Limited (section 05.03) there are at least 3000 chemicals which are widely used by Canadian industry in significant quantities. There is mounting evidence that several of these chemical substances may be hazardous to human health when encountered via occupational or environmental exposure. In addition to their inherent toxicity, some chemical compounds may decompose or react with other substances in the environment to produce products of high toxicity. This may occur even if the original compounds are relatively harmless. It is obvious therefore that a rational and systematic method must be available to identify and assess potential problem areas in the environment which may arise from the use of these chemicals. The ultimate objective is to be able to recommend or implement preventative or abatement action before a threat is posed to the community.

Beginning in fiscal year 1975-76 the Technology Development and Appraisal Section of the Air Resources Branch has been authorized by Management Board of Cabinet to initiate and maintain the Hazardous Substances Programme (HASP). Under this programme, potentially hazardous environmental contami-

nants are to be identified and assessed, and where necessary, comprehensive investigations are to be conducted on specific high-risk pollutants. This programme is projected to extend over several years.

In order to identify high-priority hazardous substances on which to concentrate Ministry efforts, it is necessary to assess the amounts of each substance actually emitted to the environment. Clearly this assessment need only be carried out relative to the acute and chronic toxic effects of each substance, arising either directly through inhalation or indirectly through deposition to soil and water. This important point allows the vast number of chemicals used in Ontario to be initially reduced to a manageable "short list" of substances on which to gather detailed data. This "short list", called the Hazardous Substances List (HASL), is the subject of this report and is given in section 05.01.

In lieu of costly and time consuming source measurements, estimation of the actual amount of each substance on HASL which is emitted to the environment requires an inventory of the quantity of the substance present at the plant site, and an approximate emission factor. An important phase of the programme, then, is to accumulate semi-quantitative, location-specific inventory data on the HASL substances which may be emitted to the environment.

The inventory data can be used to develop a prospective, rather than retrospective, approach to dealing with emissions of hazardous contaminants. The aim of HASP is to generate an "action list" of 5 to 10 highest priority substances for intensive assessment with regard to -

1. Advice to Regions on necessity for abatement activities;
2. Adequacy of sampling and analytical methods for ambient air and source effluents; need for research and development in this area;
3. Preparation of detailed background documentation in support of (1) and (2) above.
4. Development of rationale for environmental standards.

It is expected that the "action list" will be Region-specific; that is, each Region would have its own priority list of substances which require intensive activities. In this regard, the feedback of inventory data from each Region will therefore be considered separately by TDA in setting Regional priorities and in the course of developing an overall list of Ministry priorities. It is also expected that priority setting will be a dynamic process, and that priorities will undergo continual re-evaluation and re-ordering, on the basis of the information which is submitted to TDA by the Regions and of the latest results of research. Decisions on reordering of priorities will be communicated back to the Regions. Thus, the successful operation of the programme will depend upon feedback between the Regions and TDA and on a continuing basis. This should lead to optimum refinement of priorities and dedication of manpower.

The HASP programme has already produced several comprehensive reports on a few hazardous airborne substances, principally asbestos and vinyl chloride.

In order to coordinate and oversee activities associated with the Hazardous Substances Programme, the Executive Committee of the Ministry has approved the formation

of a Hazardous Substances Committee(HASC). The terms of reference of HASC will be

1. To provide an inter-ministerial forum for:
   a) the identification and assessment of potentially hazardous materials on the basis of information provided by the Ministry of Health, other health protection agencies, and other sources;
   b) the evaluation of reports or summaries on process and control technology, sampling and analytical techniques, sources and source strengths of hazardours materials; which have been prepared with the assistance and cooperation of other branches or agencies;
   c) the discussion and preparation of recommendations to Ministry of the Environment management for action on actual or potential problems,
2. To provide advice to environmental standards-setting committees on hazardous substances;
3. To coordinate and expedite the flow of scientific and technical information on hazardous substances.

HASC will be composed of representatives from each of the following branches and divisions:

Air Resources Branch
Water Resources Branch
Laboratory Services Branch
Pollution Control Branch

Regional Operations Division

Environmental Health Section,
Ministry of Health

Additional information about the formation and activities of this committee will be forthcoming.

03. PROGRAMME OVERVIEW

03.01. Scope

It is important to state the working definition of the phrase "hazardous substance". For the purpose of this programme, the Air Resources Branch is concerned primarily with industrial emissions of specific chemical compounds. A hazardous substance is taken as one which poses an identifiable threat to community health in the quantity in which it is emitted to the environment. Thus, although a substance may be highly toxic to humans, it is not hazardous unless there is an opportunity for exposure. In this context, the concept of "harmful quantity" has been widely used. This is the quantity which will produce an adverse effect on an individual receptor. That is, a substance should not be considered "hazardous" unless it is normally emitted in harmful quantity somewhere in Ontario.

Information gathered during this programme is to be used to assess adverse effects on health of the general human population due to chemical substances emitted by manufacturing and processing industries. The harmful quantity of a pollutant, then, may be referred either to the local community surrounding the emitting plant or to a much larger

receptor population depending on the nature of the chemical substance and the degree of transport.

A substance is to be considered hazardous, then, if its typical short term or long term (depending upon its toxic properties and persistence) concentration in the vicinity of a receptor population is sufficient to cause adverse health effects to any member of the community. The emphasis is on harm which may arise from typical, low-level concentrations which persist over critical periods of time and not on atypical crisis situations such as accidents or spills.

It should be noted that the range of influence of a source may extend well beyond the immediately adjacent community for tens or even hundreds of kilometers, depending upon the nature of the emitted substances and prevailing meteorological and hydrological conditions and disposal practices.

Entries on the Hazardous Substances List (HASL) should properly be referred to as "potentially hazardous", since we do not yet know whether these materials are emitted in harmful quantities in Ontario.

The primary basis for action in controlling environmental contaminants is their direct or indirect effect on human health. Secondary concerns are effects limited to animals, vegetation, materials, etc. In order to establish a tractable preliminary "short list" of potentially hazardous substances, namely HASL, it was decided to use two criteria: severity of human health effects through inhalation and the extent of usage and production. A rough ranking index was calculated as the ratio of the total amount of substance used or produced in Canada to the Ontario Occupational Health Guideline concentration (Threshold Limit Value) for that subs-

tance. The amounts used or produced in Canada were compiled by J.F. MacLaren Ltd. in a 1974 report to Environment Canada (Reference 2 of section 05.05) and for the Air Resources Branch in the 1976 data base compilation (section 05.03). These amounts, of course, do not necessarily bear any specific relationship to the amounts used or produced in Ontario, but they provide the only reasonable estimates of usage available to us at this time.

The Hazardous Substances List (HASL) which is presented in section 05.01 of this report consists, therefore, of those substances for which an Occupational Health Guideline (TLV) has been published and for which a recent semi-quantitative estimate of Canadian usage is available. In addition, some substances have been added to HASL for which no usage data are avialable but which are thought to be used in large volume in Ontario and whose toxicity to humans is known or believed to be significant in low-dose, chronic environmental exposures. Another group of substances which are known carcinogens have been included without regard to potential occurrence in Ontario but for which inventory data collection is important.

Entries on HASL have been selected, somewhat subjectively, on the basis of

1. Severe health effects.
2. Quantity present.
3. Likelihood of entering the atmosphere in harmful amounts.
4. Persistence in the atmosphere.

The initial basis toward airborne contaminants; necessitated by the data base, will be removed as other branches become more involved in the programme. The rationale behind the selection and categorization (priority assignment) is discussed in section 03.03 below.

A "short list" such as has been drawn up cannot pretend to be an exhaustive compilation of all potentially serious chemical hazards to public health. HASL is an attempt to focus attention within the Ministry on those substances which are implicated by current information as likely contaminants near industrial sites in Ontario. The list is believed to contain most chemical substances which may present contamination problems in the future. Completeness of HASL will improve as feedback from the field allows additions and deletions to be made. This fact underscores the important role to be played by the Ministry's Regional Offices.

The Hazardous Substances List, then, should serve as a reliable guide to the industrial chemicals or families of industrial chemicals for which data to assess emissions of the industrial sector in Ontario will be required.

The Hazardous Substances List and Handbook are the precursors of a detailed localized inventory of (1) quantity of a given substance present at a site, (2) the identity and location of the user together with information on the industrial process involved, and (3) an estimate of the quantities of substances present which are emitted to the environment. Inventory data will be generated from direct contact inquiries by District Officers of appropriate industries

in their districts. Certain data, as outlined in a subsequent section, are provided in the Handbook for assisting District Officers in identifying types of plants at which a substance might be expected to be found.

Not all substances in the list and Handbook will occur in all Regions. Regional and District personnel must use their best judgement based on experience and accumulated knowledge of their locales to sort out which of the entries on the list to pursue. It is very likely that each Region will discover large volume, potentially hazardous chemicals which have been omitted from HASL. This is inevitable, and such information will be incorporated in revised versions of the list.

03.02 Background

A preliminary list of potentially hazardous airborne contaminants was drawn up in 1974 on the basis of replies to a questionnairesent to major air pollution regulatory agencies in North America. These agencies were asked to list those substances or classes of substances which were (1) regulated, (2) scheduled for regulation, or (3) under study in their respective jurisdictions. The list which was compiled from these replies contained 52 chemicals or general classes of chemicals and was not specific to usage or potential emissions in Canada or Ontario.

In order to evaluate the hazard potential in Ontario of the substances on the above list, the following steps were taken during 1975/76:

1. The list of 52 substances was circulated

to the six Regional Offices for comments and for a preliminary indication of their current priorities with respect to materials on this list which were known to be used or produced by industries in their Region. Replies were received from all Regions.

2. An intensive survey of the literature (both open and limited circulation) was undertaken to provide the information necessary to assess (a) current knowledge of human health effects of substances on the list, (b) Ministry capability to sample for and analyse contaminants of interest, (c) potential sources and emission factors. A file of copies of relevant documents was established for each of the 52 substances. A card subject index was prepared for all documents in the file.
3. James F. MacLaren Ltd. were contracted to compile a computer-compatible data base of information on selected industrial chemicals known or supposed to be used in Ontario. This data base (section 05.03) comprises about 3000 individual chemical compounds, covering essentially all of the 52 substances of the original list.
4. On the basis of the MacLaren data, a short list (HASL) was drawn up, as outlined above, with respect to TLV's and Canadian usage.

03.03 Description of the Hazardous Substances List:

In an attempt to prioritize the HASL, substances have been placed in one of three categories. All entries on the List have been selected because of their severely toxic (human health) effects at low to moderate dosage (expected environmental doses).

Category A comprises those substances which are judged capable of causing irreversible acute response or chronic illness as a result of a single or brief exposure to a relatively small quantity (low dose). Substances in this category should be considered of highest priority.

Category B includes those substances which may cause chronic health effects as a result of exposure to a low concentration (typical of environmental exposure) over a long period of time. These health effects include carcinogenesis, mutagenesis, teratogenesis, neuropathy, etc. Substances in this category should be considered high priority. The subgroup within Category B which are termed "carcinogens" consists of substances which are recognized by the U.S. Occupational Safety and Health Administration (OSHA) and other regulatory agencies to be carcinogenic in man.

Category C includes substances which have known moderate to high acute (single or brief large dose) toxicity but which have low chronic toxicity or short environmental persistence (measured or conjectured). Substances in Category C are more often considered hazardous in the event of a spill which might create a large local concentration over a short period of time. In this context

they have been and continue to be the prime concerns of the Contingency Planning Section, Pollution Control Branch. Many of the substances in this category persist for relatively short periods of time in the environment because of their high chemical reactivity. Persistent substances in this category are not thought to produce chronic health effects on the basis of current information.

Within a category, substances are listed in order of decreasing estimated usage. This is intended to give a rough priority to the substances. Several important classes of substances have been omitted from HASL in order to keep the scope of the project within manageable limits. These classes are discussed below.

Section 05.01.04 consists of a modified and shortened version of HASL which was compiled by an ad hoc committee of representatives from the Ministries of Environment, Health, Labour, and Natural Resources in September, 1976. This revised list was sent in response to a request from Environment Canada (Environmental Contaminants Control Branch) and was presented as the Ontario Government's list of priority chemical substances.

"Common" or well-known pollutants, such as vinyl chloride, asbestos, polychlorinated biphenyls, etc. have been excluded from the HASL because detailed emission inventory data have been gathered already or are in the process of being collected as a result of earlier requests. Brief summaries of pertinent data on these substances have been included in section 05.04 of the Handbook. Other common

hazardous pollutants, such as sulphur dioxide, which are monitored routinely in the Ontario Air Quality Network are not treated at all in HASP, although they are important in on-going Ministry programmes.

Phytotoxicants have been excluded because of the specialized nature of research in this area - very few industrial chemicals have been evaluated for toxic effects on vegetation and even fewer have been identified as phytotoxic. Other than the common air pollutants, ethylene and boron compounds are the major known phytotoxic materials of importance in Ontario industry. As the project develops and more information becomes available, this category will be included. For the present, the survey will concentrate on substances with severe human health effects.

In the same context, substances whose environmental effects are primarily as odours or in soiling and corrosion of materials have not been included in the List.

Pesticides and herbicides have not been included in this survey of potentially hazardous pollutants because their mode of usage precludes a straight forward inventory of emissions and because they are the prime interest of the Pesticides Control Section which is responsible for administering their licensing, distribution and use under the Pesticides Act. They are definitely important as pollutants because of their mode of application(spraying) and their persistence, but again, it is difficult to include them within the scope of the present survey, since the important route of entry into the environment is not likely to be from well-defined industrial sources, that is, manufacturers.

03.04. Description of Hazardous Substances Handbook

The Handbook consists of the Hazardous Substances List (section 05.01) and various supplementary materials (sections 05.02 to 05.05) which are intended to provide background information to assist in collecting inventory data and assessing potential emissions. The data sheets (section 05.05) provide only very basic information. These sheets are not exhaustive compilations of recent scientific findings but are instead summaries of a few pertinent data from standard reference sources. Comments based on the Special Studies Unit's reading of the current literature anu on the extensive files accumulated since the start of the programme have been added to the data sheets to indicate important aspects or to place the given information in context.

As an aid to tracking down the locations of quantities of chemicals, the industrial sectors in which they are likely to be found are listed, both on the data sheets (section 05.05) and the Industrial Sector Table (section 05.02). Estimates of the relative quantities of a substance present in each of several industries are given wherever possible. It must be emphasized that these data are merely guides for planning an approach to assembling an inventory. Detailed information of this sort is not readily available, and one of the prime reasons for conducting the project, of course is to obtain good data on use and distribution of hazardous substances in the Province.

The various sections of the Handbook, particularly the Industrial Sector Table (section 05.02), provide suggestions on specific chemical compounds of the general elemental

(metallic) substances on the HASL which are of concern because of their suspected use in Ontario. However, these should not be considered restrictive. These chemicals, then, should provide a starting point in concentrating attention in the initial stages of the survey, but as the project develops (over a period of several years) it is hoped that all toxic chemicals used in large quantity by Ontario industry will be inventoried.

04. USE OF HAZARDOUS SUBSTANCES LIST

04.01. Inventory Gathering

As stated earlier, a detailed inventory is requested for each substance on HASL. This is an important phase of the overall Hazardous Substances Programme and is designed to provide the following key information.

1. The quantity of a given substance present at a site.
2. The identity and location of the user including the specific industrial applications and processes.
3. An estimate of the quantity of the substance actually emitted to the environment (source strengths or emission factors).

Since substances in Category A have high acute and chronic toxicity, they should receive first attention in approaching local industries. Category B substances, which include many proven or suspected carcinogens, should also command attention. Relative priorities have been given to the substances

within each category, based on approximate usage data, but each Region will wish to arrive at its own ordering scheme based on local usage. It should also be reiterated that the Hazardous Substances List is not intended to be exhaustive or exclusive. The specific compounds, particularly of the metallic elements, which are given in the Industrial Sector Table (section 05.02) are of concern because of their suspected use in Ontario, but they are only suggestions of compounds to pursue. Under the HASP programme, TDA is interested in obtaining inventory and other information on any substances which the Regions view with concern.

The Special Studies and Programme Planning Unit of TDA has prepared a check list which is intended to provide a recommended format for collecting and reporting the inventory data. This check list is reproduced in Section 05.02.03 of this report.

The Technology Development and Appraisal Section will be responsible for collecting and processing the inventory data from all six Regions. The data on the quantity of a given substance present at a site, and the identity and location of the user (#1, 2 above) should be reported as soon as they are gathered, and should not be delayed until the estimate on the actual emissions (#3 above) is complete. These inventory data will be compiled, along with source test results obtained by the Source Testing Unit of TDA, in a computerized system so that all data will be immediately accessible. Some of the information which is sought is already available in the form of Section 84 (Environmental Protection

Act) reports and other documents associated with Environmental Approvals certificates for new or recent plant construction. Some fragmentary data of this sort have been provided to the Contingency Planning Section of the Ministry and to Environment Canada as part of various hazardous substance inventories which have been carried out.

It is also anticipated that eventually the programme will be broadened to include information of more direct use to the Water Resources, Pollution Control and Environmental Approvals Branches of the Ministry. It is recognized that environmental problems are not confined to a single medium, but are of course multi-media problems encompassing air, water, soil, solid waste, etc. This fact should be kept in mind while gathering and supplying inventory data.

An important aspect of the overall HASP programme, particularly information processing, will be the feedback mechanisms whereby update information on the programme will be communicated between TDA and the Regional Offices. Feedback from TDA will take the form of newsletters and revised data sheets to be inserted in the Hazardous Substances Handbook. The format of the various sections of the Handbook has been designed so that this could be carried out in a consistent manner (for details, see Explanatory Notes, section 05.06). The communication will include notification of priority setting (both on Regional and overall Ministry levels) and changes in priorities, additions to the Hazardous Substances List, research and development results relevant to environmental contaminants, as well as information on other matters pertinent to HASP.

A mailing list will be maintained and all revisions and additions to the Handbook will be circulated to all parties. Revisions and additions to the Handbook will be dated.

04.02 Priority Setting

The information obtained from the Regions under this phase of the HASP programme will be used to generate a Region-specific "action list" of 5-10 highest priority substances for intensive background information collection and assessment. However, the inventory information, particularly the estimated actual emissions of each HASL substance is not the only input to be used in this priority-setting process. Two important criteria in addition are the specific health hazards associated with each substance and the population which may be affected. The responsibility for this assessment and priority-setting will be assumed initially by TDA. The Hazardous Substances Committee will have the ultimate priority-setting responsibility. The progress achieved in the setting of priorities will be communicated to the Regions as described in section 04.01.

It is anticipated that each substance, identified by the "action list" as high priority, will be the subject of a comprehensive background study and report. Various aspects of a specific pollutant may need to be investigated or summarized. These may include:

1. Physical and chemical properties.
2. Potential sources of atmospheric emissions.
3. Process and control technology for reducing emissions.

4. Available sampling methods and analytical techniques and detection limits. Research and development needs in this area are to be identified.
5. Nature, persistence, and fate of the pollutant in the atmosphere.
6. Environmental impact taking into account health effects, population affected, phytotoxicological effects, and soiling, corrosion, and odor characteristics.

In particular, source testing programs or ambient monitoring programs may be recommended. Thus, in keeping with the ultimate objectives of the HASP programme as stated in the Introduction, the Ministry of the Environment will attempt to anticipate future problems before they reach a critical stage.

05. HAZARDOUS SUBSTANCES HANDBOOK

05.01 Hazardous Substances List

Category A Compounds

05.01.01

Lead and Lead Compounds*

Nickel and Nickel Compounds*

Cobalt and Cobalt Compounds*

Maleic Anhydride

Cadmium and Cadmium Compounds*

Mercury and Mercury Compounds*

Chromium and Chromium Compounds*

Chrome Pigments (e.g., Lead Chromates)

Barium and Barium Compounds*

Selenium and Selenium Compounds*

Antimony and Antimony Compounds*

Arsenic and Arsenic Compounds*

Acrylamide

Tellurium and Tellurium Compounds*

Phosphorus

Chlorine Dioxide

Beryllium and Beryllium Compounds*

Hydrocyanic Acid

Vanadium and Vanadium Compounds*

Toluene - 2,4 - Diisocyanate

* See Industrial Sector Table (Section 05.02)

05.01.02

Category B Compounds

Kerosene

Asphalt

Sulfuric Acid

Copper and Copper Compounds*

Benzene

Carbon Black

Iron and Iron Compounds*

Hydrogen Chloride

Nitric Acid

Toluene

Aniline

Xylenes

Styrene Monomer

Phenol

Carbon Tetrachloride

Phthalic Anhydride

Molybdenum and Molybdenum Compounds*

Ethylene Oxide

Phosphoric Acid

Ethyl Chloride

Vinyl Acetate (Monomer)

Zinc and Zinc Compounds*

Ethylene Dibromide

Hydrogen Fluoride (Hydrofluoric Acid)

Methyl Chloride

Vinylidene Chloride

Magnesium and Magnesium Compounds*

Chlorobenzene

Manganese and Manganese Compounds*

Category B Compounds (cont'd)

Trichloroethylene

Naphthalene

Chloroform

Methylene Chloride

p - Dichlorobenzene

Cresols

Oxalic Acid

Morpholine

Cyanogen

Carcinogens

- 2 - Acetylaminofluorene
- 4 - Aminobiphenyl
- Benzidine (and its salts)
- 3,3' - Dichlorobenzidine (and its salts)
- Dimethylaminoazobenzene
- Naphthylamine (α and β)
- 4 - Nitrobiphenyl
- N - Nitrosodimethylamine
- β - Propiolactone
- bis - Chloromethyl Ether
- Methylchloromethyl Ether
- 4,4' - Methylene (bis) 2 - Chloroaniline
- Ethylenimine
- Dimethyl Sulfate
- Hexavalent Chromium compounds (Chromates)

Category B Compounds (cont'd)

Additional Hydrocarbons and Chlorinated Hydrocarbons (no Canadian usage data is available)

Ethylene Dichloride

Tetrachloroethylene

1,1,1 - Trichloroethane

Chloroprene

Ethyl Benzene

Cumene

Coal Tar and Pitch

Creosote

* See Industrial Sector Table (Section 05.02)

05.01.03

Category C Compounds

Compounds with Low Chronic Inhalation Toxicity or Short Atmospheric Persistence

Titanium Dioxide

Chlorine

Ammonia

Formaldehyde

Acetaldehyde

Acetic Acid (Glacial)

Ethanolamines

Sodium Cyanide

Pentaerythritol

Acrylonitrile

Ammonium Chloride

Formic Acid

Resorcinol

Dibutyl Phthalate

Acetonitrile

Iodine

Sodium Fluoride

Carbon Disulfide

Phosgene (Carbonyl Chloride)

Phosphine

05.01.04 **Ontario Ministries of Environment, Health Labour and Natural Resources. Priority Chemical Substances** Sept. 22/76

List A Substances requiring immediate detailed study
(Ranking not intended)

Lead and lead compounds*
Nickel and nickel compounds (especially nickel carbonyl)*
Mercury and mercury compounds*
Chromium and chromium compounds (especially chromates)*
Arsenic and arsenic compounds*
Cadmium and cadmium compounds*
Asbestos and other mineral fibres
Polychlorinated biphenyls (commercial mixtures)
Vinyl chloride
Polycyclic aromatic hydrocarbons (as listed, but see attached letter)
Radionuclides (^{226}Ra, ^{230}Th, radon + daughters)

List B Potentially dangerous substances to be selected for surveys under the Environment Contaminants Act
(Ranking not intended)

Selenium and selenium compounds*
Cobalt and cobalt compounds*
Barium and barium compounds*
Antimony and antimony compounds*
Acrylamide
Tellurium and tellurium compounds*
Chlorine dioxide
Beryllium and beryllium compounds*
Hydrocyanic acid
Vanadium and vanadium compounds*
Toluene 2,4-diisocyanate
Aromatic hydrocarbons
- benzene
- xylene
- cumenes
- ethyl benzene
- toluene
- styrene

Phenols (as listed)
Chlorinated and brominated hydrocarbons
- carbon tetrachloride
- ethyl chloride
- methyl chloride
- vinylidene chloride
- trichlorethylene
- chloroform
- methylene chloride
- ethylene dichloride
- tetrachloroethylene
- 1,1,1-trichloroethane
- chloroprene
- ethylene dibromide
- chlorinated naphthalenes
- hexachlorobutadiene
- chlorobenzene
- hexachlorobenzene

Phthalic esters
Manganese and manganese compounds*
Mercaptans
Phytotoxicants
- ethylene

* Chemical form to be specified

"Carcinogens" (Similar to lists of U.K, U.S., and TLV regulated carcinogens)

hydrazine***
o-dianisidine***
magenta***
auramine***
4,4'-methylene (bis)2-chloroaniline (MOCA)**
3,3'-dichlorobenzidine (and salts)**
2-acetylaminofluorene
4-aminobiphenyl
benzidine(and salts)
dimethylaminoazobenzene
napthylamine (α- and β-)
4-nitro biphenyl
N-nitrosodimethylamine
β-propiolactone
bis-chloromethyl ether
methylchloromethyl ether
ethylenimine
dimethyl sulphate
propane sultone

** Known extensive usage in Ontario
*** Known to be used in Ontario but information not available on extent of usage.

Pesticides

Of those pesticides listed in the preliminary DOE/NHW list, only chlordane is used to any extent in Ontario; the problem is seen to be primarily one of disposal. It is recommended that the number of registered pesticides be reduced and that more extensive "effects" research be done on the limited number of pesticides. Release of pesticides to the environment can probably be controlled through federal and provincial pesticides legislation.

Phenols

- brominated phenols
- chlorinated phenols:
  - o-chlorophenol
  - 2,4-dichlorophenol
  - pentachlorophenol
  - tetrachlorophenol
- 2,4-dimethylphenol
- nitrophenols:
  - mononitrophenol
  - 2,4-dinitrophenol
  - dinitrocresol
- cresols: chlorinated cresols
- cresylic acid
- creosote
- naphthols:
  - chlorinated
  - brominated

Polycyclic aromatic hydrocarbons and derivatives

- anthracene
  - benzanthracenes
  - 9,10-diphenylanthracene
- chrysenes (benzophenanthrene)
- fluorenes
  - acetylaminofluorene
  - benzo (a) fluorene
- fluoranthene
  - benzofluoranthene
- naphthalenes
  - chlorinated
  - brominated
  - acthylnaphthalene
  - acetonaphthalene
- phenanthrene
  - 2-methylphenanthrene
- perylene
  - benzoperylene
- pyrene
  - methyl pyrene
  - benzo(a,b)pyrene
  - dibenzopyrene
  - indenopyrenes

05.02 Chemical Usage Identified by Industrial Sector

05.02.01 Code for Industrial Sectors:

CODE NUMBER	INDUSTRY TYPE	COMMENTS
1-6	INORGANIC CHEMICALS	
1	Industrial Gases	Establishments producing gases such as oxygen, nitrogen, hydrogen, and carbon dioxide.
2	Chlor-Alkali	Establishments producing chemicals such as soda ash, caustic soda, and chlorine.
3	Electrolytic	Establishments producing chemicals by the aid of electricity.
4	Sulphur and Sulphuric Acid.	
5	Other Inorganic	Other Inorganic Chemical Industries.
6	Total Inorganic Use	Indicates the percentage of the total quantity used by the Inorganic Chemical Industries.
7	ORGANIC CHEMICALS	
8-12	MISCELLANEOUS CHEMICALS	Establishments primarily engaged in manufacturing chemical products, not elsewhere classified.
8	Explosives	Establishments producing chemical explosives and ammunition.
9	Pesticides	
10	Photographic	
11	Other Miscellaneous	Establishments producing miscellaneous products such as adhesives, polishes, etc.
12	Total Miscellaneous	Indicates the percentage of the total quantity used by MISCELLANEOUS CHEMICAL INDUSTRIES.
13	IRON AND STEEL	Establishments having blast furnaces steel mills, rolling mills, coke ovens or some combination of these.
14	POWER	
15	REFINERIES	Establishments primarily engaged in refining crude petroleum or in

CODE NUMBER	INDUSTRY TYPE	COMMENTS
15 (cont'd)		blending products such as lubricating oils and greases.
16	BEVERAGES	Breweries Distilleries Wineries Soft drink manufacturers
17	OILS, FATS, WAXES	
18	TEXTILES AND LEATHER	Leather Tanneries Textile Dyeing and Finishing Plants
19	CEMENT	
20	CERAMICS	Clay Products Manufacturers-Domestic Clay Products Manufacturers-Imported
21	WATER AND WASTE TREATMENT	Information was available on the use of chemicals by muncipal waterworks only.
22	PLATING	
23	PHARMACEUTICALS AND MEDICINE	Manufacturers of Pharmaceuticals and Medicine Manufacturers of Toilet Preparations
24	SOAP AND CLEANING COMPOUNDS	
25	BATTERY MANUFACTURERS	
26	PULP AND PAPER	
27	PRINTING INKS	
28	PIGMENTS AND DRY COLOURS	
29	PAINT AND VARNISH	Includes manufacturers of putty, filler, oil stains, and thinners.
30	PLASTICS AND SYNTHETIC RESINS	
31	RUBBER	
32	GLASS AND GLASS PRODUCTS	
33	SUGAR	
34	FERTILIZERS	Establishments primarily engaged in manufacturing mixed fertilizers. Does not include production of pure chemicals.

CODE NUMBER	INDUSTRY TYPE	COMMENTS
35	OTHER INDUSTRIES	Indicates use of a chemical compound other than those contained in Codes 1-34

Quantity Code: AS - shipped
E - exported
EU - exported plus used
I - imported
P - produced
PI - produced plus imported
S - sales
U - used
PIU - produced plus imported plus used.

NOTE* Numeral in brackets () indicates the percentage of the total quantity present which is associated with the specific industrial sector.

05.02.02 Industrial Sector Table:

		Quantity (tons)
Acetaldehyde	7(99%)	U 43560
Acetic Acid	5,6(.1%),7(11%),9,10,11,12(.1%),18(3%),23,28(.5%), 30(85%),35	U 16155
Acetonitrile	7,15,17,23	I 205
2 - Acetylaminofluorene		
Acrylamide	11,18,21,28,29(99%),30,35	U 60
Acrylonitrile	7,30,31	I 1845
4 - Aminobiphenyl		
Ammonia	1,2,5,6 (36%),7(5%),11,12 (27%),13,15,21,26(33%),28,30,31 34(9%),35	PIU 353147
Ammonium Chloride	5,22(26%),23,25(46%),30,31(28%,34,35	U 1640
Aniline	7,8,9,10,23	
Antimony Potassium Tartrate	9,18,23	I 20
Antimony Trichloride		
Antimony Trioxide		I 422
Arsenic	32(99%),35	U 140
Arsenic Trioxide	5,9,12(99%),18,20,29,32	U 2 65
Arsenic Trisulfide		
Arsine		
Asbestos		P 1,654,000
Asphalt		P 2585000
Barium	35	
Barium Acetate	18,29	
Barium Carbonate	2,6(97%),7(3%),9	I 3600
Barium Chloride	2,6(74%),18,28(26%)	U 485
Barium Chromate	8,28	
Barium 2-Ethylhexoate	27,30	
Barium Ferrite		
Barium Hydroxide		

	Quantity (tons)
Barium Naphthenates 27,28	
Barium Nitrate 7,8	
Barium Nonyl Phenate 30	
Barium Oxalate 7	
Barium Stearate 8,30,31	
Barium Sulphate 10,29,30	
Barium Trinitrophloroglucinate 8	
Benzene 5,7(96%),15(3%),29(.3%),35	PI 300838
Benzidine	
Benzidine Yellow Xylidine 29(99%)	U 55
Beryllium 35	U 0.3
Beryllia Ceramics 20	
Beryllium-Aluminum Alloys 35	
Beryllium-Copper Alloys 35	
Beryllium Oxide	
Cadmium and Compounds	P 926
Cadmium Benzoate 30	
Cadmium Chloride	
Cadmium Cyanide 22	
Cadmium 2-Ethylhexoate 29	
Cadmium Nitrate 28(99%),32	U 5
Cadmium Oxide	
Cadmium Selenide 28(99%)	U5
Cadmium Stearate	U5
Cadmium Sulphate 22,28(99%)	U5
Cadmium Sulphide 8,20,28(99%)	U5
Cadmium Sulphoselenides 28(99%)	U5
Carbon Activated 5,6(1%),7(23%),21(69%),28(1%),33(6%)	U 1065
Carbon Black 11,12(.2%),27(1%),29(1%),30,31 (97%)	U 86280

		Quantity (tons)
Carbon Disulphide	5,6(99%), 30	U 50
Carbon Tetrachloride	5,6(39%),7(59%),9,12(1%),34(.4%)	U 18445
Carbonyl Chloride (Phosgene)	7,9,28	
Chlorine	1,2,5,6(5%),7(7%),9,15,18,21,24,26(85%),28,30	PI 849926
Chlorine Dioxide	4,17,21(99%),26	U 25
Chlorobenzene	9,15,29	I 2580
Chloroform	9,15,28	I 1660
bis - Chloromethyl Ether		
Chloroprene		
Chrome Pigments	28(99%)	U 1455
Chromic Acid	18,22,27	
Chromite		
Chromium Acetate	18	
Chromium Lignosulphonates	18	
Chromium Sulphate		I 1356
Coal Tar and Pitch		
Cobalt Acetate	7(99%),27,28,29	U 10
Cobalt Blue	28 (99%)	U 1
Cobalt Ethylhexoate	29	
Cobalt Decanoates	27	
Cobalt Linoleate	29	
Cobalt Naphthenates	29	
Cobalt Soaps	29 (99%)	U 325
Cobalt Tallate	29	
Cobalt Tetracarbonyl		
Copper 2-Ethylhexoate	29	
Copper Naphthenate	9,29	
Copper Oleate	9,23,35	
Copper Oxides	7,9,13,20,22,23,25,29,30,32	I 105

		Quantity (tons)
Copper 8-Quinolinolate	9	
Copper Sulphate	9,12(69%),13,18,21(31%),22,23,25,31	I 2270
Copper Tallate	29	
Creosote	23,35	
Cresols	7(14%),11,12(25%),18,30(61%)	I 685
Cumene	7	
Cumene Hydroperoxide	7,30	
Cupric Acetate	9,31	
Cupric Chloride	8,9,10,15,21,27	
Cupric Citrate		
Cupric Dichromate		
Cupric Nitrate	10,22,29	
Cupric Salicylate		
Cyanogen		
Cyanogen Iodide	23	
Dibutyl Phthalate	7,8,10,29(37%),30(63%)	U 320
1, 2 - Dichlorobenzene	9,18,22,28,30	
1, 4 - Dichlorobenzene	9,12(99%),22,28	U 740
3,3'-Dichlorobenzidine		
Dimethylaminoazobenzene		
Dimethyl Sulfate		
Ethanolamines	24(99%)	AS 9648
Ethylbenzene	30	
Ethyl Chloride	7(99%),9,17	U 13455
Ethylene	7,30	P 448064
Ethylene Dibromide	7(99%),9,15,23,30	I 8615
Ethylene Dichloride	7,15,24,30	

		Quantity (tons)
Ethylene Oxide	7(76%),15,24(24%),30	U 15675
Ethylene Thiourea		
Ethylenimine		
Ethylnitrosonitroguanidine		
Ferric Chloride	10,21,23,28	
Ferric Nitrate	18,22,23	
Ferrocene		
Ferrophosphorus	13	
Ferrosilicon	13	
Ferrous Fumarate	23	I 10446
Ferrous Phosphide	13	
Ferrous Phosphogluconate	23	
Ferrovanadium		
Formaldehyde	5,6(9%),7(2%),11,12(7%),18,23,29(3%),30(79%)	P 63802
Formic Acid	5,6(6%), 18(94%)	I 960
Hydrochloric Acid	5,6(74%),7(8%),11,12(3%),22(3%),23(2%) 26(6%),28(2%),30,32,33	U 70175
Hydrocyanic Acid		
Hydrofluoric Acid	5,6(37%),7(63%)	U 4795
Hydrogen Chloride, Anhydrous	7,30	
Hydrogen Peroxide	7,16,18(24%),22,26(76%)28,30,31	U 1790
Hydrogen Sulphide	5,7,35	
Hypophosphorus Acid	22	
Iodine	5,22,23(99%),28	I 200
Iron Blue	27,28,29(99%),34	U 55
Iron 2 - Ethylhexoate	30,31	

		Quantity (tons)
Iron Naphthenate	28,29	
Iron Oxides	19(96%),22,28,29(4%)	U 73460
Iron Oxide, Synthetic	28,29	
Iron Selenide	13	
Iron Sorbitol	23,29	
Iron Tallate	28,29	
Kerosene		PI 2,860,000
Lead		PI 206749
Lead Acetate	9,18,23,28,29	
Lead Azide	8	
Lead Azotetrazole	8	
Lead Carbonate	20,28,29(99%)	U 490
Lead Chloride	5,28	
Lead Chromate	28	
Lead Dinitroresorcinate	8	
Lead 2- Ethylhexoate	28,29	
Lead Fluoborate	22	
Lead Fumarate	30	
Lead Isodecanoate	29	
Lead Monoxide	5,6,7 (3%),11,12,18,20,23,25(74%),27,28(21%),29,31	U 10325
Lead Naphthenates	15,29,30	
Lead Neodecanoate		
Lead Nitrate	8,10,18,28,29	
Lead Oxides	20,25,29,35	
Lead Perchlorate		
Lead Phosphite	29,30	
Lead Phthalate	30	
Lead Silicate	20,30(99%), 35	U 280
Lead Stearate	15,29,30	
Lead Styphnate	8	

		Quantity (tons)
Lead Sulphate	7(99%),20,28,29,30	U 160
Lead Tallate	28,29	
Lead Tetroxide	20,25(99%),28,29	U 280
Lead Tetraethyl		
Lead Trinitrophloroglucinate	8	
Magnesium		PI 11876
Magnesium Acetate	18,23,28	
Magnesium Bile Salts	23,24	
Magnesium Calcium Carbonate	18,26	
Magnesium Chloride	18,19,26,35	
Magnesium Hydroxide	26,28,33	
Magnesium Lauryl Sulphate	24	
Magnesium Lignosulphonates	9,18,19,28	
Magnesium Naphthenate	28,29	
Magnesium Nitrate	8,35	
Magnesium Oxide	13,19,23,26,31,34(99%),35	U 2685
Magnesium Salicylate	23	
Magnesium Silicate	17,20,26,29,30,31,32,35	
Magnesium Stearate	28,29,30,35	
Magnesium Sulphate	18,20,23,(84%),28,34(16%)	U 855
Magnesium Xylene Sulphonate	30,31	
Maleic Anhydride	7(7%),17,18,28,29(35%),30(58%)	U 1665
Manganese	13	I 2545
Manganese Carbonate	18,22,23	
Manganese Dioxide	8,25(50%),28,29(50%)	U 4400
Manganese 2-Ethylhexoate	27,28,29	
Manganese Isodecanoate	30	
Manganese Linoleate	23,29	
Manganese Naphthenate	29	

	Quantity (tons)
Manganese Neodecanoate 30	
Manganese Soaps 29(99%)	U 90
Manganese Sulphate 9,20,22,29	
Manganese Tallate 29	
Mercuric Chloride	
Mercuric Nitrate 7,23	
Mercuric Oxide	
Mercurous Nitrate 7,23	
Mercury	PI 335
Methyl Chloride 7(99%), 9,15,30,31	U 3215
Methylchloromethyl Ether	
4,4′- Methylene (<u>bis</u>) 2- Chloroaniline	
Methylene Chloride 7,9,10,18,23,29(99%),30	U 915
Molybdate Orange 27,29(99%),30	U 545
Molybdenum Disulphide 15,30,35	
Molybdenum Oxides 7,22	
Molybdenum Trioxide 15,20,22,23,28	I 35
Morpholine 7, 17,24,31	I 305
Naphthalene 8,9,12(99%),18,30	U 1675
Naphthylamine	
Nickel Carbonate 20,22	
Nickel Carbonyl	
Nickel Chloride 22	
Nickel 2- Ethylhexoate 27,28,29	
Nickel Ferrite 13	
Nickel Oxide 5,20,26	
Nickelous Acetate 18	
Nickel Selenide 13	
Nickel Subsulfide	
Nickel Sulphate 11,18,20,22	
Nitric Acid 5,6(.9%),7(96%),15,23,28(3%)	U 54160
4 - Nitrobiphenyl	
N-Nitrosodimethylamine 10	

	Quantity (tons)
Oxalic Acid 12(99%),18,22,25	I 435
Pentaerythritol 8,9,23,29(58%),30(42%)	U 3800
Phenol 7(14%),9,12,(3%),15(2%),23,29,30(80%)	U 29595
Phenol Formaldehyde Resins 29(99%),30	AS 44260
Phenol Sulphonic Acid 22,23,28,35	
Phosphine	
Phosphoric Acid 5,6(68%),7(11%),11,12(15%),15,16,17,18,20,21,22,23, 24,29(3%),33(2%),34	AS 13508
Phosphoric Anhydride 5,7,23,30,33,35	
Phosphorus, Amorphous 5,8,12(99%)	U 25
Phosphorus Sesquisulphide 7,12(99%)	U 10
Phosphorus, Yellow 5,6(99%),8,9,22,34	U 24370
Phthalic Anhydride 5,6,7(14%),9,12(5%),23,28,29(36%),30(44%)	U 18390
Polychlorinated Biphenyls (PCB's)	U 500
β - Propiolactone	
Resorcinol 7,23,28,30,31	I 735
Resorcinol Resins 30(99%)	U 245
Selenium Compounds	P 426
Selenium Diethyldithiocarbamate 31	
Selenium Dioxide 23,35	
Selenous Acid 35	
Sodium Arsenate	
Sodium Cyanide 5,22,28,30,35	I 4760
Sodium Fluoride 9,12,(99%),13,21,22,23,32	U 152
Styrene-Acrylic Copolymers	
Styrene-Acrylonitrile Copolymers	
Styrene Monomer 29(6%),30(94%)	U 37250
Sulphur Dioxide 4,5,15,16,21,26(99%),35	U 39095

		Quantity (tons)
Sulphuric Acid	4,5,6 (48%),7(5%),8,10,12(2%),13,15(4%),18,21,22,24 (2%),25,26(14%),28(14%),29,30(3%),33,34(6%),35	PI 2739262
Sulphur Trioxide	4,5,24	
Tellurium		P 33
Tellurium Dioxide	13,35	
Tetrachloroethylene		
Tetraethyllead	15	
Tetramethyllead	15	
Titanium	13,22,35	I 290
Titanium Carbide	35	
Titanium Dioxide		PI 855659
Titanium Sulphate	28	
Titanium Tetrachloride	5,28,32	
Toluene	5,6,7(55%),8,12(5%),15,24,29(36%),30(3%), 31	U 54113
Toluene 2, 4 - Diisocyanate	30	
Toluene Sulphonic Acid	7,28	
1,1,1, - Trichloroethane		
Trichloroethylene	7,9,17,24(67%),29(33%),35	I 2080
Vanadium Naphthenate	29,30	
Vanadium Pentoxide	4,7,10,14,18,20,23,35	
Vanadium Trioxide		
Vinyl Acetate Monomer	11,12(50%),29(11%),30(39%)	U 11125
Vinyl Acetate Copolymer Resins	29(99%),30	U 72
Vinyl Chloride Monomer	29(99%),30	PIU 130,000
Vinyl Chloride Copolymer Resins	29(99%),30	U 760
Vinylidene Resins	30	
Vinylidene Chloride		I 2760
Vinyl Monomers	30(99%)	U 89430

		Quantity (tons)
Xylenes	7(58%),9,12(6%),1523,28,29(32%),30(3%)	U 49180
Zinc		UE 468785
Zinc Acetate	18, 23,28,35	
Zinc Ammonium Bisulphite	34	
Zinc Ammonium Chloride	22,25,35	U 105
Zinc Chloride	5,6(2%),7(2%),15,18,22,25 (96%),28,32	U 635
Zinc Chromate	29(99%),35	
Zinc Dibutyl Thiocarbamate	15,30	
Zinc Diethyl Thiocarbamate	30,31	
Zinc Dust	5,8,28,29,30	I 711
Zinc 2-Ethylhexoate	30,35	
Zinc Hydrosulphite	23,26(99%)	U 7255
Zinc Isodecanoate	30	
Zinc Laurate	29	
Zinc Lignosulphonates		
Zinc Mercaptobenzothiazole	9,31	
Zinc Naphthenates	9,29,30	
Zinc Neodecanoate		
Zinc Nitrate	7,23,30,35	
Zinc Oxide	7(1%),10,12 (2%),20,23,28(4%),29(10%),30,31(82%)	U 10205
Zinc Peroxide	23,35	
Zinc Selenide	10,35	
Zinc Stearate	23(99%),28,29.30	U 15
Zinc Sulphate	5,9,12(99%),18,26	I 1660
Zinc Tallate	30,31	

Additions:

	Quantity (Tons)
Chromium Oxide	I 531
Cobalt	P 2614
Cobalt Oxide	E 923
Copper	PI 557611
Ferrochrome	I 22943
Ferromanganese	I 19721
Molybdenum Soluble Compounds	P 17677
Nickel	P 308042

Air Resources Branch

05.02.03 HAZARDOUS SUBSTANCES PROGRAMME - SOURCE INVENTORY CHECKLIST

The first phase of the source inventory for potentially hazardous industrial emissions is the collection of data on the location and quantity present of Category A, and then Category B, substances as detailed in the Hazardous Substances Handbook.

Phase two will be the collection of more detailed data on a limited number of priority substances which will be required to estimate source emission strengths and dispersion characteristics. Activities associated with the second phase might be: 1) formal source testing; 2) detailed engineering process evaluation - mass balance determination, emission factor calculations, etc. These sorts of investigations obviously require detailed data which cannot be obtained for all substances at all plants in a short period of time. Thus, it is hoped that reasonable priority assessments can be made on the basis of the limited quantitative and qualitative data sought in phase one.

The following check list indicates the information which is thought to be necessary for the next level of refinement of the Hazardous Substances List. As a priority list of manageable length evolves, the effort required to produce detailed source strength documentation, such as for Section 84 or Approvals use, will be focussed on a relatively small number of substances.

Check List of Information Required for Phase 1 of the HASP Source Inventory:

1. Name of substance (combine reports on several substances at a given site, if appropriate).

2. MOE Region and District.

3. MOE official(s) preparing report.

4. Date of preparation; effective date of data supplied.

5. Name and full address of company and plant site.

6. Name and telephone number of plant official supplying information.

7. Major business or manufacturing activity carried out at plant.

8. Operating conditions in plant with reference to this substance:

   a) Approximate number of hours per day, days per week, weeks per year, etc., normally in operation for processes involving this substance;

   OR

   b) Estimate of relative production (processing) schedule for this substance on an annual basis (occasional, regular but light, regular and heavy, continuous throughout year).

9. Weekly, monthly, yearly (as appropriate) plant inventory (quantity) or use rate of this substance:

   a) As raw material in chemically pure form (labelled as such);

   b) As raw material in a mixture (grade, chemical composition, etc.);

   c) As raw material in a related chemical form which may be converted to this substance in processing (name of related form);

   d) As an intermediate product;

   e) As a final (market) product;

   f) As a waste (non-market) product.

10. Trade names of various materials inventoried above in which this substance is a major or minor constituent; chemical composition or grade, supplier's name.

11. MOE official's estimate of potential for release of this substance to the atmosphere at this site on a numerical scale of one (low) to ten (high).

12. Estimates of release potential of this substance to other media:

    a) water: 1 (low) ... 10 (high)

    b) soil: 1 (low) ... 10 (high)

13. Estimate of relative amounts of this substance which would be present in waste from this plant:

    a) liquid waste: 1 (low) ... 10 (high)

    b) solid waste: 1 (low) ... 10 (high)

14. Population density in vicinity of plant:

    a) Immediate surroundings - (sparse, moderate, dense, very dense);

    b) Within 5 km radius - (sparse, moderate, dense, very dense).

15. Might the surrounding population be particularly vulnerable to emissions of this substance for any reason? (Brief explanation.)

Preliminary Information for Phase 2 of HASP Inventory:

16. Information on availability of, or plans for, MOE approval certificate or Section 84 documentation on this plant pertaining to this substance - reference details only (do not supply documents).

17. Other documentation of processes at this plant involving this substance; reference details.

18. Are available data on this plant sufficient to calculate or estimate approximate emission rates for this substance?

19. Would source testing be necessary to determine approximate emission rates? Would it be feasible?

20. Are source test data available for this substance at this plant (other than data already in TDA file)? Ambient air quality test data? Provide reference details, but not data.

05.03 Hazardous Substances Data Base Compilation

James F. MacLaren Limited
Environmental Consultants
Willowdale, Ontario

February 1976

05.03.01 References for Data Base Compilation

General References

(A) James F. MacLaren Limited, "Hazardous Polluting Substances in the Lower Great Lakes" for Environment Canada, March 1974.

(B) James F. MacLaren Limited, "Report on an Update of Hazardous Polluting Substances in the Lower Great Lakes", for Environment Canada, September 1975.

(C) Statutes of Ontario, "The Environmental Protection Act, 1971", as amended by 1972, Chapter 1, s.69; 1972, Chapter 106; 1973 Chapter 94 and 1974, Chapter 20.

(D) Revised Regulations of Ontario, "Regulation 15", as amended by O. Reg. 973/74.

References (cont'd)

14. Elliot, T.C. "Odors - More Nuisance than Health Threat." Power. October, 1969.

15. Hawley, G.G., et al. "The Condensed Chemical Dictionary." Van Nostrand Reinhold. Eight Edition, 1971.

05.03.02 Code Description

Physical Properties

Col. No. 1 - Physical State
Col. No. 2 - Vapour Pressure at Indicated Temperature
Col. No. 3 - State Change and Temperature

TLV - TWA - CAR

Col. No. 4 - TLV or TWA
Col. No. 5 - TLV or TWA Unit Reference
Col. No. 6 - Data Source Reference
Co. No. 7 - Carcinogenic Indicator

Toxic Test Data

Col. No. 8 - Dosage or Concentration
Col. No. 9 - Unit Reference
Col. No. 10 - Description of Exposure
Col. No. 11 - Route of Exposure or Administration
Col. No. 12 - Species Exposed
Col. No. 13 - Data Source Reference

Odour Information

Col. No. 14 - Type of Response
Col. No. 15 - Threshold Concentration
Col. No. 16 - Information Source Reference

Additional Information

Col. No. 17 - Phytotoxicological Data Indicator
Col. No. 18 - LD50 oral-Rat Test Data
Col. No. 19 - Quantity Determination Code
Col. No. 20 - Quantity Present

Physical Properties

Col. No. 1 - Physical State

G - Gas
L - Liquid
S - Solid

cont'd

Code (cont'd)

Physical Properties (cont'd)

Col. No. 2 - Vapour Pressure at Indicated Temperature (V.P. - oC)

V.P.: in mm (Hg) unless indicatd by A (atmospheres)

Temp = degrees C.

Col. No. 3 - State Change and Temperature (oC - State Change)

B - boils
D - decomposes
E - explodes
F - flash point
I - ignites
M - melts
S - sublimes

TVA - TWA - CAR

Col. No. 4 - Threshold Limit Value or Time Weighted Average

Col. No. 5 - TLV or TWA Unit Reference

Units for TLV - TWA are mg./m^3 unless indicated in this column

* = m.p.p.c.f.
X = fibres per ml.

Col. No. 6 - Data Source Reference

See list of references following this section

Col. No. 7 - Carginogenic Indicator

Indicates tests have shown carcinogenic effects

Toxic Test Data

Col. No. 8 - Dosage or Concentration

Col. No. 9 - Unit Reference

Units for Col. No. 8 are mg./m^3 unless indicated in this column.

cont'd

Code (cont'd)

Toxic Test Data (cont'd)

Col. No. 9

X - m.p.p.c.f.
P - p.p.m.
K - mg./kg. of body weight

Col. No. 10 - Description of Exposure

TDLO - toxic dose low
TCLO - toxic concentration low
LDLO - lethal dose low
LD50 - lethal dose fifty
LCLO - lethal concentration low
LC50 - lethal concentration fifty

Col. No. 11 - Route at Exposure or Administration

ICV - Intracervical	ITR - Intratracheal
IDR - Intradermal	IVG - Intravaginal
IDU - Intraduodenal	IVN - Intravenous
IHL - Inhalation	OCU - Ocular
IMP - Implant	ORL - Oral
IMS - Intramuscular	PAR - Parenteral
IPC - Intraplacental	REC - Rectal
IPL - Intrapleural	SKN - Skin
IPR - Intraperitoneal	SCU - Subcutaneous
IRN - Intrarenal	UNK - Unreported

Col. No. 12 - Species Exposed

BRD - bird (lab.)	INF - infant
BDW - wild bird	MAM - unspecified mammal
CAT - cat	MAN - man
CTL - cattle	MKY - monkey
CKN - chicken	MUS - mouse
CHD - child	PIG - pig
DOG - dog	PGN - pigeon
DOM - domestic animal	QAL - quail (lab.)
DCK - duck	RBT - rabbit
FRG - frog	RAT - rat
GRB - gerbil	SQL - squirrel
GPD - guinea pig	TOD - toad
HAM - hamster	TRK - turkey
HMN - human	WMN - woman

Col. No. 13 - Data Source Reference

See list of references following this section.

cont'd

Code (cont'd)

Odour Information

Col. No. 14 - Type of response

D = detection
R = recognition
U = implies unspecified

Col. No. 15 - Response Concentration (mg./m^3)

Col. No. 16 - Information Source Reference

See list of references following this section

Additional Information

Col. No. 17 - Phytotoxicological Data Indicator

P - indicates phytotoxicological data included

Col. No. 18 - LD50 ORAL-RAT Test Data

Col. No. 19 - Quantity Determination Code

AS - shipped
E - exported
EU - exported plus used
I - imported
P - produced
PI - produced plus imported
S - sales
U - used

Col. No. 20 - Quantity Present (tons)

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	OCCUR-INFO 14	15 16	PHY 17	O-RAT 18	QUANTITY 19	20
ABS RESINS	S													
ACETALDEHYDE	L	740-20	20.2-B	180		1		245 - TCLO-IHL-HMN-4	D-	0.12- 8			U-	43560
ACETAMIDE	S	1-65	223-B					360-K-TDLO-ORL-RAT-4						
ACETANILIDE	S	1-114	305.0-B					800-K-LD50-ORL-RAT-4				800		
ACETIC ACID	L	11.4-20	118.1-B	25		1		2040 - TDLO-IHL-HMN-4	D-	2.45- 6			U-	16155
ACETIC ANHYDRIDE	L	10-36	139.9-B	20		1		4250 - LCLO-IHL-RAT-4	U-	1.50- 7				
ACETOBROMOGALACTOSE														
ACETOBROMOGLUCOSE														
ACETOBROMOMANNOSE														
ACETONE	L	400-39.5	56.2-B	2400		1		1200 - TCLO-IHL-HMN-4	U-	77.10- 7			U-	4335
ACETONE CYANOHYDRIN	L		82-B					220 - LCLO-IHL-RAT-4						
ACETONITRILE	L		82-B	70		1		13650 - LCLO-IHL-RAT-4					I-	205
ACETOPHENETIDINE	S		135-M					1000-K-TDLO-ORL-HMN-4						
ACETOPHENONE	L	1-15	202.3-B					3000-K-LD50-ORL-RAT-4	U-	2.95- 7		3000		
2-ACETYLAMINO-FLUORENE	S		194-M	CAR		1	C	580-K-LDLO-ORL-RAT-4						
ACETYL BROMIDE	L		76.7-B						D-	0.50- 6				
ACETYL CHLORIDE	L		51-B											
N-ACETYL-L-CYSTEINE								400-K-LDLO-IPR-MUS-4						
ACETYLENE	G	40A-16	-84-B						U-	0.06- 6			P-	43000
ACETYLENE BLACK (SEE CARBON BLACK)				3.5		1		120-K-LD50-IVN-RAT-4					U-	86280
ACETYL PHENYL-HYDRAZINE														
ACRIDINE	S	1-129.4	346-B					500-K-LD50-ORL-MUS-4						
ACROLEIN (SEE HERBICIDES)	L		52.5-B	0.25		1		1.6 - TCLO-IHL-HMN-4	R-	0.48- 6				
ACRYLAMIDE	S	1.6-84.5	84.5-M	0.30		1		126-K-LDLO-ORL-RAT-4					U-	60
ACRYLIC ACID	L	10-39	141-B					18000 - LCLO-IHL-RAT-4	U-	3.10- 7			I-	12360
ACRYLIC RESINS													I-	15920
ACRYLONITRILE	L	100-22.8	77.3-B	45		1		570 - LCLO-IHL-RAT-4	U-	3.40- 8			I-	18-5
ACRYLONITRILE-BUTADIENE RESINS													I-	6130
ADIPAMIDE														
ADIPIC ACID	S	1-159.5	152-M					1900-K-LD50-ORL-MUS-4					U-	390
ADIPONITRILE	L		295-B					40-K-LDLO-IPR-MUS-4						
ALDOL	L		182-B					140-K-LD50-SKN-RAT-4						
ALKYD RESINS													U-	25150
ALKYL ARYL BROMIDE														
ALKYLDIMETHYLBENZYLAMMONIUM CHLORIDE	L													
ALKYL SULPHATE														
ALKYLTRIMETHYLBENZYLAMMONIUM CHLORIDE								30-K-LD50-ORL-FRG-4						
ALLYL ALCOHOL (SEE FUNGICIDES)	L	10-10.5	96-B	5		1		60 - TCLO-IHL-HMN-4	D-	3.30- 6				
ALLYL CHLORIDE	L		44.6-B	3		1		6370 - LCLO-IHL-RAT-4	U-	1.50- 9				
ALLYL GLYCIDYL ETHER				22		1		922-K-LD50-ORL-RAT-4				922		
ALLYL PROPYL DISULPHIDE	L			12		1		18.5 - TCLO-IHL-HMN-4						
ALUM CAKE (SEE ALUMINUM SULPHATE)	S		770-D					4.2-K-LD50-ORL-MUS-4						U-126920
ALUMINUM	S	1-1284	660-M											PIJ115341
ALUMINUM ACETATE	S													
ALUMINUM AMMONIA SULPHATE	S		94.6-M											
ALUMINUM CHLORIDE	S	1-100	180.2-S					3.8-K-LD50-ORL-MUS-4					U-	850
ALUMINUM FLUORIDE	S	1-1238	1040-[illegible]											
ALUMINUM FORMATE, BASIC	S													
ALUMINUM HYDROXIDE	S													
ALUMINUM NITRATE	S		150-D					4280-K-LD50-ORL-RAT-4				4280		
ALUMINUM OLEATE	L													
ALUMINUM OXIDE	S	1-2158	2050-M	30	*	1		357 - TCLO-IHL-MUS-4						
ALUMINUM POTASSIUM SULPHATE														
ALUMINUM SILICATE	S													

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	ODOUR-INFO 14	15	16	PHY 17	O-RAT 18	QUANTITY 19	20
ALUMINUM STEARATE	S														
ALUMINUM SULPHATE	S		770-D					4.2-K-LD50-ORL-MUS-4						U-	50
P-AMINODIETHYLANILINE HCL								200-K-LDLO-ORL-RAT-4						U-126820	
P-AMINODIMETHYLANILINE	S		151-B					935-K-LD50-ORL-RAT-4					935		
P-AMINODIMETHYLANILINE HCL															
N-AMINOETHYL-N-HYDROXYETHYL OLEAMIDE															
N-AMINOETHYL-N-HYDROXYETHYL STEARAMIDE															
2-AMINO-2-METHYL-L-PROPANOL HYDROCHLORIDE															
P-AMINOPHENOL	S		284-D	CAR		1	C	1270-K-LD50-ORL-RAT-4					1270		
N-(3-AMINO-PROPYL)ROSINAMINE DIACETATE															
2-AMINOPYRIDINE	S		210.6-M	2		1		15.3 - TCLO-IHL-HMN-4							
2-AMINOTHIAZOLE	S		96-M					200-K-LDLO-IPR-MUS-4							
2-AMINO-1,3,4-THIADIAZOLE															
4-AMINO-M-TOLUENE SULPHONIC ACID															
AMMONIA	G	10A-26	-33-B	18		1		14 - TCLO-IHL-HMN-4	U-	0.03-	8	P		PIU353147	
AMMONIUM ACETATE								58-K-LD50-IVN-MUS-4							
AMMONIUM ALGINATE															
AMMONIUM BICARBONATE	S		46-D					245-K-LD50-IVN-MUS-4							
AMMONIUM BIFLUORIDE	S														
AMMONIUM BISULPHIDE	S		-D					80-K-LDLO-ORL-MUS-4							
AMMONIUM BISULPHITE			-D												
AMMONIUM BOROFLUORIDE															
AMMONIUM BROMIDE	S	1-198	396-B												
AMMONIUM CARBAMATE	S		60-S					39-K-LD50-IVN-RAT-4							
AMMONIUM CARBONATE	S							96-K-LD50-IVN-MUS-4							
AMMONIUM CHLORIDE	S	1-160	337.6-B	10		1		1650-K-LD50-ORL-RAT-4					1650	U-	1640
AMMONIUM CHLOROPLATINATE	S		-D	4.6		4		.0009 - TCLO-IHL-HMN-4							
AMMONIUM CHROMATE	S		-D												
AMMONIUM CITRATE															
AMMONIUM DICHROMATE	S		-D												
AMMONIUM DODECYLBENZENESULPHONATE															
AMMONIUM FLUORIDE	S		-S					150-K-LDLO-ORL-GPG-4							
AMMONIUM HYDROXIDE	L		77-M					350-K-LD50-ORL-RAT-4					350		
AMMONIUM LACTATE															
AMMONIUM LAURYL ETHER SULPHATE															
AMMONIUM LAURYL SULPHATE															
AMMONIUM LIGNOSULPHONATES															
AMMONIUM NITRATES	S		210-D												
AMMONIUM NITRATE SULPHATE														UE-776616	
AMMONIUM OXALATE	S														
AMMONIUM PERCHLORATE	S		-D												
AMMONIUM PERSULPHATE	S		120-D					820-K-LD50-ORL-RAT-4					820		
AMMONIUM PICRATE	S		-D												
AMMONIUM PHOSPHATES	S														
AMMONIUM PHOSPHATE,DIBASIC	S													P-915617	
AMMONIUM PHOSPHATE,MONOBASIC	S														
AMMONIUM SALTS	S														
AMMONIUM SILICO FLUORIDE	S		-S												
AMMONIUM STEARATE	S														
AMMONIUM SULPHATE	S		-D					58-K-LD50-ORL-RAT-4						PI-383128	
AMMONIUM SULPHIDE	S		-D					80-K-LCLO-ORL-MUS-4							
AMMONIUM SULPHITE	S		150-S												
AMMONIUM TARTRATE															
AMMONIUM THIOCYANATE	S		170-D					500-K-LDLO-IPR-MUS-4							

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAP 4	5 6 7	TOXIC-TEST-DATA 8 9 10 11 12 13	OCCUP-INFO 14	15 16	PHY 17	O-RAT 18	QUANTITY 19	20
AMMONIUM TOLUENE SULPHONATE	S											
AMMONIUM XYLENE SULPHONATE												
S-AMYL ACETATE	L		120-B	650	1	50000 - LCLO-IHL-GPG-4						
N-AMYL ACETATE	L		146-B	525	1	1000 - TCLO-IHL-HMN-4	O-	0.60- 6				
N-AMYL ALCOHOL	L	1-13.6	138-B			1390-K-LDLO-ORL-DOG-4	U-	3.60- 7				
T-AMYL ALCOHOL	L	10-17.2	102-B			1000-K-LD50-ORL-RAT-4				1000		
AMYL CHLORIDE	L		105-B									
AMYLNITROSONITROGUANIDINE												
ANILINE	L	1-34.8	184-B	19	1	975 - LCLO-IHL-RAT-4	U-	0.90-10				
ANILINE HYDROCHLORIDE	S		199-M			841-K-LD50-ORL-MUS-4						
ANISIC ALDEHYDE	S		39-M			1260-K-LD50-ORL-GPG-4						
ANISIDINE	L		22.5-M	0.5	1	1.9 - TCLO-IHL-HMN-4						
P-ANISYLCHLORODIPHENYLMETHANE												
ANTHRACENE	S	1-145	217-M									
ANTIMONY AND COMPOUNDS	S	1-886	630-M	0.5	1	4.7 - TXCO-IHL-MAN-2						
ANTIMONY OXIDE(SEE ANTIMONY TRIOXIDE)	S	1-574	655-M	1.32	4	4000-K-LDLO-IPR-RAT-4					I-	422
ANTIMONY PENTACHLORIDE	L	1-22.7	140-B	1.22	4	675-K-LD50-ORL-RAT-4				675		
ANTIMONY PENTAFLUORIDE	L		149-B									
ANTIMONY PENTASULPHIDE	S		-D	1.65	4	1500-K-LD50-IPR-RAT-4						
ANTIMONY POTASSIUM TARTRATE	S			0.5	4	2-K-LDLO-ORL-HMN-4					I-	20
ANTIMONY SULPHATE	S		-D			1000-K-LDLO-IPR-RAT-4						
ANTIMONY SULPHIDE	S		550-M	1.4	4	565 - LCLO-IHL-MAN-4						
ANTIMONY TRICHLORIDE	S		73.4-M	0.93	4	131 - TCLO-IHL-MAN-4						
ANTIMONY TRIETHYL (SEE TRIETHYLSTIBINE)	L	1-49.2	159.5-B									
ANTIMONY TRIFLUORIDE	S		292-M									
ANTIMONY TRIMETHYL (SEE TRIMETHYLSTIBINE)	L		80.5-B			1370-K-LDLO-SCU-CAT-4						
ANTIMONY TRIOXIDE (SEE ANTIMONY OXIDE)	S	1-574	655-M	1.32	4	4000-K-LDLO-IPR-RAT-4					I-	422
ANTU(A-NAPHTHYL-THIOUREA)	S		198-M	0.3	1	6-K-LD50-ORL-RAT-4				6		
D-ARABINAL DIACETATE												
D-ARABINOSE												
ARGON	G		-185-B									
ARSENIC AND COMPOUNDS AS METAL	S	1-372	615-S	0.5	1	25-K-LDLO-IMS-RAT-4					U-	140
ARSENIC DIETHYL	L		185-B									
ARSENIC DIMETHYL	L		165-B									
ARSENIC PENTASELENIDE	S											
ARSENIC TRICHLORIDE	L	10-23.5	130-B			100 - LCLO-IHL-CAT-4						
ARSENIC TRIOXIDE	S		193-S	0.05	4	0.11 - TCLO-IHL-HMN-4					U-	265
ARSENITE												
ARSINE	G		-55-B	0.2	1	1.6 - TCLO-IHL-HMN-4	U-	1.60- 3				
ASBESTOS	S			5	X 1	1.2-X-					P1654000	
ASCORBIC ACID	S		192-M			88-K-LD50-IPR-RAT-4						
ASPHALT (PETROLEUM) FUMES	G		470-B	5	1							
1-AZA-3,7-DIOXA-5-HYDROXYMETHY,BICYCLO (33,0)OCTANE												
AZELAIC ACID	S	1-178	106-M								I-	310
AZETIDINE												
AZOETHANE												
1,1-AZOISOBUTANE												
2,2-AZOISOBUTANE												
2,2-AZOISOPROPANE												
AZO ETHANE												
AZOSULPHAMIDE												
9-BARABICYCLO (3,3,1) NONANE												
BARITE (SEE BARIUM SULPHATE)	S		1580-M									

COMPOUND NAME	PHYSICAL-PROPERTIES			TLV-TWA-CAR				TOXIC-TEST-DATA	ODOUR-INFO		PHY		O-RAT	QUANTITY	
	1	2	3	4	5	6	7	8 9 10 11 12 13	14	15	16	17	18	19	20
BARIUM AND COMPOUNDS	S	10-1049	850-M	0.5		1									
BARIUM ACETATE	S			0.93		4		236-K-LDLO-ORL-RBT-4							
BARIUM CARBONATE	S		1740-B					630-K-LDLO-ORL-RAT-4						I-	3600
BARIUM CHLORIDE	S		1560-B	0.81		4		80-K-LDLO-ORL-HMN-4						U-	485
BARIUM CHROMATE	S														
BARIUM CYANIDE	S														
BARIUM 2-ETHYLHEXOATE															
BARIUM FERRITE															
BARIUM FLUORIDE	S		1280-M					350-K-LDLO-ORL-GPG-4							
BARIUM NAPHTHENATE								355-K-LD50-ORL-RAT-4					355		
BARIUM NITRATE	S		592-M	0.95		4									
BARIUM NONYL PHENATE															
BARIUM OXALATE	S														
BARIUM STEARATE	S														
BARIUM STYPHNATE															
BARIUM SULPHATE (SEE BARITE)	S		1580-M												
BARIUM SULPHIDE	S														
BARIUM TRINITROPHLOROGLUCINATE															
BAUXITE (SEE ALUMINUM SULPHATE)	S		770-D												
BENZANILIDE															
BENZENE	L	100-26.1	80-B	32		4		660 - TCLO-IHL-HMN-4	U-	1.30-10				PI-300838	
BENZENE BORONIC ACID								740-K-LD50-ORL-RAT-4					740		
BENZENE HEXACHLORIDE	S	0.03-20	157-M	0.5		3		1700-K-LD50-ORL-CAT-4							
BENZENE SULPHONATE															
BENZENE-SULPHONIC ACID	S		43-M					75-K-LD50-ORL-BRD-4							
BENZIDINE	S		128-M	CAR		1	C	214-K-LD50-ORL-MUS-4							
BENZOIC ACID	S	1-96	121.7-M					2370-K-LD50-ORL-MUS-4						I-	455
BENZONITRILE	L	1-28.2	228-B					180-K-LDLO-SCU-MUS-4							
2-BENZOYL-1,3-DICHLOROPROPANE															
BENZOYL PEROXIDE,DRY	S		104-M	5		1		12 - TCLO-IHL-HMN-4							
BENZYL CHLORIDE	L			5		1		65 - TCLO-IHL-HMN-4	D-	0.21-10					
3-BENZYL-5,5-DIMETHYL-2-IMIDAZOLINETHIONE															
4-BENZYLISOTHIAZOLE															
BENZYL-TRIALKYL AMMONIUM CHLORIDE	L		135-M												
BENZYL-TRIMETHYL AMMONIUM CHLORIDE	S														
BERYLLIUM	S		1278-M	.002		1		0.1 - TCLO-IHL-HMN-4						U-	0.3
BERYLLIUM CARBONATE	S			.002		4		50-K-LD50-IPR-GPG-4							
BERYLLIUM CHLORIDE	S	1-291	440-M	.002		4		86-K-LD50-ORL-RAT-4					86		
BERYLLIUM HYDROXIDE	S		138-D	.002		4		0.8-K-LD50-IVN-RAT-4							
BERYLLIUM NITRATE	S		60-M	.002		4		501-K-LD50-IPR-RAT-4							
BERYLLIUM OXIDE	S		2500-M	.002		4		54-K-TDLO-IPR-RAT-4							
BERYLLIUM SELENATE	S														
BERYLLIUM SULPHATE	S		550-M	.002		4		1.8-K-LD50-IHL-RAT-4							
BISACODYL															
BIS-BENZYL ETHYLENE DIAMINE DIACETATE															
BIS(P-CHLOROPHENOXY) METHANE	S		70-M												
N,N,-BIS(1,4-DIMETHYL PENTYL)-P-PHENYLENE DIAMINE															
BISMUTH AND SALTS	S	1-1021	271-M											P-	286
BISMUTH TELLURIDE	S		572-M	10		1									
BISPHENOL-A	S			2.8		1		1900 - LCLO-IHL-RAT-4							
BIS(TRI-N-BUTYLTIN)OXIDE								194-K-LD50-ORL-RAT-4					194		
BON (ALSO B-OXYNAPHTHOIC ACID)															
BORIC ACID	S		185-D					640-K-LDLO-ORL-HMN-4						U-	30
														I-	450

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	OCCUR-INFO 14	15	PHY 16	17	O-RAT 18	QUANTITY 19	20
BORON	S		2300-M					2000-K-LD50-ORL-MUS-4							
BORON CARBIDE	S		2450-M												
BORON OXIDE	S		450-M	10		1									
BORON TRIBROMIDE	L	40-14	91.7-B	10		1									
BORON TRICHLORIDE	L	1-12.7	12.5-B					100 - LCLO-IHL-RAT-4							
BORON TRIFLUORIDE	G		-110.7-B	3		1		109 - LC50-IHL-GPG-4							
BROMIC ACID	L		100-C					1200 - LCLO-IHL-RBT-4							
BROMINE	L	175-21	58.7-B	0.7		1			R-	0.31- 6					
BROMINE PENTAFLUORIDE	L		40.5-B	0.7		1									
P-BROMO ANISOLE															
3-BROMO-3,5-DINITROBENZANILIDE															
4-BROMO-3,5-DINITROBENZANILIDE															
BROMOFORM (ALSO TRIBROMOMETHANE)	L		149.5-B	5		1		1820-K-LD50-SCU-MUS-4	U-	5480- 8					
4-BROMO-2-NITROBENZANILIDE															
2-BROMO-4-NITROPHENOL															
2-BROMO-4-NITROPHENOL															
2-BROMO-4-NITROPHENOL (NA SALT)															
2-BROMO-3-NITROSALICYLANILIDE															
3-BROMO-3-NITROSALICYLANILIDE															
4-BROMO-3-NITROSALICYLANILIDE								15-K-LDLO-IPR-MUS-4							
4-BROMO-5-NITROSALICYLANILIDE															
4-BROMO-3-NITRO-O-SALICYLOTOLUIDIDE															
1,2-BUTADIENE															
1,3-BUTADIENE	G	1840-21	-4.5-B	2200		1		285-K-LC50-IHL-RAT-2	U-	2.40- 7				I-	1670
BUTADIENE-STYRENE RESINS															
BUTANE	G	2A-18.8	-0.5-B	1200		1		658 - LC50-IHL-RAT-4	U-	14.30-11				P-	104200
2-BUTANONE (SEE METHYL ETHYL KETONE)	L	71.2-20	79-B	590		1		6000 - LCLO-IHL-RAT-4	R-	29.50- 6				U-	1080
BUTENE-1	G	3480-21	-6.3-B						D-	3.00- 6					
2-BUTOXY ETHANOL	L	0.6-20	171.2-B	240		1		1480-K-LD50-ORL-RAT-4					1490		
N-BUTYL ACETATE	L	15-25	126-B	700		1		960 - TCLO-IHL-HMN-4	U-	0.20- 7				U-	1485
S-BUTYL ACETATE	L		112-B	950		1		950 - TCLO-IHL-HMN-4							
T-BUTYL ACETATE	L		96-B	950		1		950 - TCLO-IHL-HMN-4							
BUTYL ACETYL RICINOLEATE	L		220-B												
N-BUTYL ACRYLATE	L	10-35.5	69-B					5325 - LCLO-IHL-RAT-4						U-	215
N-BUTYL ALCOHOL	L	5.5-20	117.5-B	300		1		77 - TCLO-IHL-HMN-4	D-	0.20- 6				U-	5590
S-BUTYL ALCOHOL	L	10-20	99.5-B	450		1		771-K-LD50-IPR-MUS-4							
T-BUTYL ALCOHOL	L	40-24.5	82.8-B	300		1		6000-K-LDLO-ORL-RBT-4	U-	1.20- 7				U-	310
C-BUTYLAMINE	L		77-B	15		1		500-K-LD50-ORL-RAT-4	U-	0.72- 7			500		
BUTYLATED HYDROXYTOLUENE								940-K-LDLO-ORL-CAT-4							
S-BUTYL BENZENE	L	1-18.6	173.5-B					2240-K-LD50-ORL-RAT-4					2240		
N-BUTYL BENZENE	L	1-22.7	182.1-B												
T-BUTYL CHROMATE				0.1		1									
BUTYL DECYL PHTHALATE															
BUTYLENES														I-	2970
BUTYL-2-ETHYLHEXYL PHTHALATE															
N-BUTYL GLYCIDYL ETHER				270		1		2050-K-LD50-ORL-RAT-4					2050		
T-BUTYL HYDROPEROXIDE	L							1500-K-LD50-ORL-RAT-4					1500		
BUTYL ISOOCTYL PHTHALATE															
BUTYL LACTATE	L	0.4-20	188-B	25		1		200-K-LDLO-IPR-RAT-4							
BUTYLLITHIUM															
BUTYL MAGNESIUM CHLORIDE	L														
BUTYL MERCAPTAN	L		98-B	2		1		10 - TCLO-IHL-HMN-4	D-3.0026- 8						
BUTYL METHACRYLATE	L		163-B					256-K-LDLO-IPR-MUS-4						U-	265
BUTYL NITROSONITROGUANIDINE															

COMPOUND NAME	PHYSICAL-PROPERTIES			TLV-TWA-CAR				TOXIC-TEST-DATA	ODOUR-INFO		PHY		O-RAT	QUANTITY	
	1	2	3	4	5	6	7	8 9 10 11 12 13	14	15	16	17	18	19	20
BUTYL OLEATE	L		173-B												
T-BUTYL PERBENZOATE	L	0.33-50						4160-K-LDLO-ORL-RAT-4							
P-T-BUTYL PHENOL	L	1-70	238-B					2520-K-LD50-SKN-RBT-4							
N-SEC-BUTYL-N-PHENYL-PARA-PHENYLENEDIAMINE															
BUTYL RICINOLEATE	L		275-B												
BUTYL RUBBER															
BUTYL STEARATE	L		220-B												
BUTYL TIN COMPOUNDS															
P-BUTYLTOLUENE	L			60		1		1500-K-LD50-ORL-RAT-4					1500		
BUTYL XANTHATES															
BUTYRALDEHYDE	L		75.7-B					2490-K-LD50-ORL-RAT-4	U-	0.03-10			2490		
BUTYRALDEHYDE-ANILINE	L														
BUTYRALDOXIME	L		152-B					200-K-LDLO-IPR-MUS-4						U-	20
BUTYRIC ACID	L	0.43-20	163.5-B					2940-K-LD50-ORL-RAT-4	U-	0.0036-10			2940		
CACODYLIC ACID	S		200-M					1350-K-LD50-ORL-RAT-4					1350		
CADMIUM AND COMPOUNDS	S	1-394	321-M	0.1		1		15-K-LDLO-IMS-RAT-4						P-	926
CADMIUM BENZOATE	S														
CADMIUM CHLORIDE	S	10-656	560-M					8 - LC90-IHL-DOG-4							
CADMIUM CYANIDE	S		200-D												
CADMIUM 2-ETHYLHEXOATE															
CADMIUM FLUORIDE	S	1-1112	1100-M					150-K-LD50-ORL-GPG-4							
CADMIUM NITRATE	S		350-M											U-	5
CADMIUM OXIDE	S	1-1000	9000-M	0.05		1		9 - TCLO-IHL-HMN-4							
CADMIUM PHOSPHATE	S		1500-M					650 - LCLO-IHL-MUS-4							
CADMIUM POTASSIUM CYANIDE	S														
CADMIUM SELENIDE	S		1350-M											U-	5
CADMIUM SULPHATE	S		1000-M					2-K-LDLO-SCU-RAT-4						U-	5
CADMIUM SULPHIDE	S		1750-M					90-K-LDLO-SCU-RAT-4						U-	5
CADMIUM SULPHOSELENIDES														U-	5
CAFFEINE	S		236.8-M					1500-K-TDLO-ORL-RAT-4							
CALCIUM	S	10-983	542-K											P-	200
CALCIUM ACETATE	S							52-K-LD50-IVN-MUS-4							
CALCIUM ALGINATE	S														
CALCIUM ARSENATE	S			1		1		753-K-TDLO-UNK-HMN-4							
CALCIUM ARSENITE	S														
CALCIUM CARBIDE	S		2300-M											U-	9420
CALCIUM CARBONATE	S		825-M											U-	56655
CALCIUM CASEINATE															
CALCIUM CHLORIDE	S		772-M					1000-K-LD50-ORL-RAT-4					1000	I-	16365
CALCIUM CITRATE	S													P-	8885
CALCIUM CYANAMIDE	S		1300-M					1400-K-LD50-ORL-RBT-4						UE-	132765
CALCIUM CYANIDE	S		350-D					39-K-LD50-ORL-RAT-4					39		
CALCIUM DISODIUM ETHYLENEDIAMINETETRA ACETATE	S							3800-K-LD50-IPR-RAT-4							
CALCIUM DISULPHITE														U-	120765
CALCIUM DODECYLBENZENE SULPHONATE															
CALCIUM 2-ETHYLHEXOATE															
CALCIUM FLUORIDE	S														
CALCIUM HYDRIDE	S		1360-M												
CALCIUM HYDROXIDE	S		600-D											UE-	120130
CALCIUM HYPOCHLORITE	S													I-	2560
CALCIUM IODATE	S		-D												
CALCIUM IODIDE															
CALCIUM ISODECANOATE															
CALCIUM LIGNOSULPHONATES															

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	ODOUR-INFO 14 15	PHY 16 17	C-RAT 18	QUANTITY 19 20
CALCIUM LINOLEATE												
CALCIUM MAGNESIUM HYDROXIDE												
CALCIUM MAGNESIUM OXIDE												
CALCIUM NAPHTHENATE												
CALCIUM NEO-DECANOATE												
CALCIUM NITRATE	S		561-M									
CALCIUM ORTHOSILICATE												
CALCIUM OXIDE	S		2850-M									UE-506760
CALCIUM PANTOTHENATE	S		170-M	5		1		820-K-LD50-IPR-RAT-4				
CALCIUM PHOSPHATES	S											I- 23485
CALCIUM PHOSPHATE,MONOBASIC	S		200-D									
CALCIUM PLUMBATE	S		-D									U- 15
CALCIUM PROPIONATE	S											
CALCIUM SILICATE	S											
CALCIUM STEARATE												
CALCIUM SULPHATE DIHYDRATE	S		-D									
CALCIUM SULPHATE	S		1450-B									
CALCIUM TALLATE												U- 345
CALCIUM THIOCYANATE	S											
CALCIUM XYLENE SULPHONATE												
CAMPHOR	S		175-M	12		1		900-K-LD50-IPR-RAT-4	U- 10.00- 8			
CAPRIC ACID								129-K-LD50-IVN-MUS-4				
CAPROIC ACID	L	0.18-20	205-B					1050-K-LD50-SKN-RBT-4				
CAPROLACTAM	S	6-120	69-M	1		1		33 - TDLO-IHL-HMN-4				
CAPRYLIC ACID	L		237-B					600-K-LD50-IVN-MUS-4				
CARBON BLACK (SEE ACETYLENE BLACK)				3.5		1		120-K-LD50-IVN-RAT-4				U- 86280
CARBON CHLOROFORM EXTRACT (CCE)												
CARBON DIOXIDE	G		-57.5-S	9000		1		3660 - TCLO-IHL-HMN-4				U- 22030
CARBON DISULPHIDE	L	400-28	46.5-B	60		1		300-K-LDLO-SCU-RBT-4	R- 0.65- 6			U- 50
CARBON MONOXIDE	G		-191.5-B	55		1		750 - TCLO-IHL-HMN-4				
CARBON TETRABROMIDE	S	40-96.3	40-M	1.4		1		1000-K-LDLO-ORL-RAT-4				
CARBON TETRACHLORIDE	L	100-23	76.5-B	65		1		120 - TCLO-IHL-HMN-4	R-134.60- 6			U- 16445
CARBONYL CHLORIDE (ALSO PHOSGENE)	G	1130-20	8.3-B	0.4		1		305 - LC50-IHL-RAT-4	R- 4.00- 6			
CARBOXYMETHYL CELLULOSE												U- 10
CASEIN	S											U- 295
CASTOR OIL	L		313-B									I- 3233
CATECHOL (ALSO PYROCATECHOL)	S	10-118	105-M	4.5		1		3980-K-LD50-ORL-RAT-4			3980	
CELLULOSE ACETATE	S		260-M									I- 2950
CELLULOSE ACETATE BUTYRATE												I- 1070
CELLULOSE NITRATE	S		160-I									I- 2865
CELLULOSE,REGENERATED												I- 870
CERIUM NAPHTHENATE												U- 10
CESIUM HYDROXIDE	S		272-M	2		1		1026-K-LD50-ORL-RAT-4			1026	
CETYL ALCOHOL	S		49.3-M									
CETYLDIMETHYL AMMONIUM BROMIDE ALKYLATE												
CETYLPYRIDINIUM-BROMIDE	S											
CETYL SULPHATE												
CETYLTRIMETHYL-AMMONIUM BROMIDE								125-K-LD50-IPR-RBT-4				
CHLORAMPHENICOL								693-K-LD50-ORL-RAT-4			693	
CHLORAMPHENICOL PALMITATE												
CHLORAURIC ACID (SEE GOLD TRICHLORIDE)												
CHLORDIAZEPOXIDE HYDROCHLORIDE								546-K-LD50-ORL-RAT-4			548	
CHLORINATED BENZENE												
CHLORINATED CAMPHENE (SEE TOXAPHENE)	S		65-M	0.5		1		2000-K-LDLO-ORL-HMN-4				

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAP 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	ODOUR-INFO 14	15	16	PHY 17	O-RAT 18	19	QUANTITY 20
CHLORINATED DIPHENYL OXIDE				0.5		1								U-	280
CHLORINATED PARAFFINS															
CHLORINATED TRISODIUM PHOSPHATE															
CHLORINE	G	4900-20	-34.5-B	3		1		44 - TCLO-IHL-HMN-4	R-	0.91- 6				PI-849526	
CHLORINE DIOXIDE	G		9.9-B	0.3		1		53 - TCLO-IHL-HMN-4						U-	25
CHLORINE TRIFLUORIDE	G		11.8-B	0.4		1		365 - LC50-IHL-RAT-4							
CHLOROACETALDEHYDE	L	100-45	95-B	3		1		23-K-LD50-ORL-RAT-4					23		
3-CHLORO-5-ACETAMINOSALICYLANILIDE															
CHLOROACETOPHENONE	S	.012-0	56-M	0.3		1		119 - TCLO-IHL-HMN-4	D-	0.10- 6					
CHLOROANILINE				0.22		1		256-K-LD50-ORL-MUS-4							
P-CHLOROBENZANILIDE															
CHLOROBENZENE	L	10-22.2	131.7-B	350		1		2910-K-LD50-ORL-RAT-4	R-	1.00- 6			2910	I-	2580
CHLOROBENZILATE								8900 - LC50-IHL-MAN-4							
CHLOROBENZYLIDENE MALONONITRILE	S		310-B	0.4		1		178-K-LD50-ORL-RAT-4					178		
CHLOROBROMOMETHANE	L		67.9-B	1050		1		4300-K-LD50-ORL-MUS-4							
4-CHLORO-5-BROMO-3-NITROSALICYLANILIDE															
CHLORODENE															
CHLORODIFLUOROMETHANE	G		-40.8-B	3500		1									
4-CHLORO-2,5-DIHYDROXY DIPHENYL SULPHONE															
4-CHLORO-2,5-DIETHOXY-3-NITROSALICYLANILIDE															
2-CHLORO-3,5-DINITROBENZANILIDE															
3-CHLORO-3,5-DINITROBENZANILIDE															
4-CHLORO-3,5-DINITROBENZANILIDE															
3-CHLORO-3,5-DINITRO-2-BENZOTOLUIDIDE															
5-CHLORO-3,5-DINITRO-3-BENZOTOLUIDIDE															
3-CHLORO-3,5-DINITRO-6-BENZOTOLUIDIDE															
2-CHLORO-3-4-DINITROSALICYLANILIDE															
CHLOROFORM	L	100-10.4	61.2-B	125		1		50 - TCLO-IHL-MAN-4	D-	3320- 6				I	1660
4-CHLOROHEXYL-2,6-DINITROPHENOL,TECH															
CHLORODIPHENYL	L		350-5	0.5		1		500-K-LD50-ORL-RAT-4					500		
3-CHLORO-3-HYDROXYBENZANILIDE															
4-CHLORO-3-HYDROXYBENZANILIDE															
CHLOROMETHYL METHYL ETHER				.005		1	C	6 - TCLO-IHL-MUS-4							
2-CHLORO-5 METHYL-3-NITRO SALICYANILIDE															
2-CHLORO-2-METHYL PROPANE															
3-CHLORO-2-NITROBENZANILIDE															
2-CHLORO-3-NITROBENZANILIDE															
3-CHLORO-4-NITROBENZANILIDE															
5-CHLORO-2-NITROBENZANILIDE															
3-CHLORO-3-NITROBENZANILIDE															
2-CHLORO-4-NITROBENZANILIDE															
4-CHLORO-2-NITROBENZANILIDE															
5-CHLORO-4-NITROBENZANILIDE															
3-CHLORO-2-NITRO-[illegible]-BENZOTOLUIDIDE															
2-CHLORO-3-NITRO-[illegible]-BENZOTOLUIDIDE															
5-CHLORO-2-NITROPHENOL															
CHLORONITROPROPANE (SEE KORAX)	L		139.5-B	100		1		362-K-LD50-SKN-RBT-4							
5-CHLORO-3-NITRO-[illegible]-SALICYLANILIDE															
2-CHLORO-3-NITROSALICYLANILIDE															
2-CHLORO-5-NITROSALICYLANILIDE															
3-CHLORO-2-NITROSALICYLANILIDE														[illegible]-K-LDLO-IPR-MUS-4							
3-CHLORO-5-NITROSALICYLANILIDE								15-K-LDLO-IPR-MUS-4							
4-CHLORO-3-NITROSALICYLANILIDE								15-K-LDLO-IPR-MUS-4							
4-CHLORO-5-NITROSALICYLANILIDE								40-K-LDLO-IPR-MUS-4							

COMPOUND NAME	1	2	3	4	5	6	7	8–13 TOXIC-TEST-DATA	14–16 ODOUR-INFO	17 PHY	18 O-RAT	19	20 QUANTITY
3-CHLORO-3-NITRO-O-SALICYLOTOLUIDIDE													
4-CHLORO-3-NITRO-O-SALICYLOTOLUIDIDE													
6-CHLORO-3-NITRO-O-SALICYLOTOLUIDIDE													
2-CHLORO-3-NITRO-P-SALICYLOTOLUIDIDE													
4-CHLOROPHENOL	S	1-44.2	32.5-M					570-K-LD50-ORL-RAT-4	D-.00016- 6		570		
O-CHLOROPHENOL (SEE BIOCIDES)	L	1-12.1	174.5-B					670-K-LD50-ORL-RAT-4	D-.00019- 6		670		
P-CHLOROPHENOL	S	1-49.6	42.6-M					670-K-LD50-ORL-RAT-4			670		
3-(P-CHLOROPHENOL)-1,1-DIMETHYL UREA													
P-CHLORO-PHENYL-P-CHLOROBENZENSULPHAMATE								2000-K-LD50-ORL-RAT-4			2000		
CHLOROPRENE	L		59.4-B	90		1		1950-K-LD50-ORL-RAT-4	U- 0.46- 8		1950		
CHLOROPROMAZINE HYDROCHLORIDE								0.14-K-TDLO-ORL-HMN-4					
CHLOROPROPAMIDE								318-K-LD50-IPR-RAT-4					
3-CHLOROPROPENE	L		44.6-B	3		1		1550-K-LD50-ORL-RAT-4			1950		
O-CHLOROSTYRENE				285		1							
CHLOROSULPHONIC ACID	L	1-32	151-B										
2-CHLOROTHIOPHENOL													
4-CHLORO-O-TOLOXY-ACETIC ACID								700-K-LD50-ORL-RAT-4			700		
O-CHLOROTOLUENE	L	10-43.2	159-B	250		1		82 - TCLO-IHL-HMN-4					
2-CHLORO-6-(TRICHLOROMETHYL) PYRIDINE				10		1							
CHLORYL HYDRATE													
CHOLESTEROL								600-K-LDLO-SCU-MUS-4					
CHOLESTERYL CHLOROFORMATE													
CHOLIC ACID	S							1600-K-LDLO-SCU-FRG-4					
CHOLINE BITARTRATE	S												
CHOLINE CHLORIDE								3400-K-LD50-ORL-RAT-4			3400	I-	1245
CHROME PIGMENTS				0.10		4		400-K-LD50-IPR-GPG-4				U-	1455
CHROMIC ACID (SEE CHROMIUM TRIOXIDE)	S		196-M	0.10		1		0.11 - TCLO-IHL-HMN-4					
CHROMIC CHLORIDE (SEE CHROMIUM CHLORIDE)	S		158.4-M					1870-K-LD50-ORL-RAT-4			1870		
CHROMIC FLUORIDE	S		1000-M										
CHROMIC OXIDE (SEE CHROMIUM OXIDE)												I-	531
CHROMIC SULPHATE (SEE CHROMIUM SULPHATE)	S							247-K-LDLO-IVN-MUS-4				I	1356
CHROMIUM	S	1-1616	1890-M					400-K-TDLO-IMP-RAT-4					
CHROMIUM (SOLUBLE,CHROMOUS SALTS)				0.5		1							
CHROMIUM (INSOLUBLE COMPOUNDS)				1.0		1							
CHROMIUM ACETATE	S						C	125-K-TDLO-IMP-RAT-4					
CHROMIUM CHLORIDE (SEE CHROMIC CHLORIDE)	S		158-M					1870-K-LD50-ORL-RAT-4			1870		
CHROMIUM CYANIDE													
CHROMIUM LIGNOSULPHONATES													
CHROMIUM OXIDE (SEE CHROMIC OXIDE)				0.1		4	C	125-K-TDLO-IMP-RAT-4				I-	531
CHROMIUM POTASSIUM SULPHATE	S												
CHROMIUM SULPHATE (SEE CHROMIC SULPHATE)	S							247-K-LDLO-IVN-MUS-4				I-	1356
CHROMIUM TRIOXIDE (SEE CHROMIC ACID)	S		196-M	0.1		1		0.11 - TCLO-IHL-HMN-4					
CHYMOTRYPSIN													
CITRIC ACID	S		153-M					975-K-LD50-IPR-RAT-4	D-10480 - 6			AS-	4762
CLOFIBRATE													
CLOFIBRATE DIETANOLAMINE SALT													
CLOPIDOL (ALSO COYDEN)				10		1							
COAL (DUST)	S			2.0		1						PI9999999	
COAL TAR PITCH VOLATILES				0.2		1							
COBALT (DUST AND FUMES)	S		1495-M	0.1		1		20-K-LDLO-ORL-RAT-4				P-	2614
COBALT ACETATE	S							25-K-LD50-IVN-MUS-4				U-	10
COBALT BLUE												U-	1
COBALT CHLORIDE	S		1049-M					55-K-LD50-ORL-GPG-4					
COBALT 2-ETHYLHEXOATE													

COMPOUND NAME	PHYSICAL-PROPERTIES			TLV-TWA-CAR				TOXIC-TEST-DATA	ODOUR-INFO		PHY	O-RAT	QUANTITY	
	1	2	3	4	5	6	7	8 9 10 11 12 13	14 15	16	17	18	19	20
COBALT ISODECANOATE														
COBALT LINOLEATE														
COBALT NAPHTHENATE	S							3900-K-LD50-ORL-RAT-4				3900		
COBALT NEODECANOATE														
COBALT NITRATE	S		100-M					400-K-LDLO-ORL-RBT-4						
COBALT OXIDES	S		1800-M					1700-K-LD50-ORL-RAT-4				1700	E-	923
COBALT TALLATE														
COCONUT FATTY ACID													U-	125
COCONUT OIL	L		20-M										PI-	38974
COD OIL	L												U-	310
COPPER DUST AND MIST	S	1-1628	1083-M	1.0		1							PI-	557611
COPPER FUME	S	1-1628	1083-M	0.2		1		1.0 - TDLO-IHL-HMN-4						
COPPER ACETOARSENITE	S							22-K-LD50-ORL-RAT-4				22		
COPPER CARBONATE	S		200-D	1.0		4		159-K-LD50-ORL-RAT-4				159		
COPPER CHLORIDE	S		495-M	1.0		4		140-K-LD50-ORL-RAT-4				140		
COPPER CITRATE (SEE CUPRIC CITRATE)	S													
COPPER CYANIDE	S		-D					50-K-LDLO-IPR-RAT-4						
COPPER DISODIUM VERSENATE														
COPPER 2-ETHYHEXOATE														
COPPER 8-HYDROXYQUINOLINE	S		210-D											
COPPER NAPHTHENATE	S													
COPPER NITRATE	S		114.5-M											
COPPER OLEATE	S													
COPPER OXIDE BLACK	S		1026-D											
COPPER OXIDE RED	S		1235-M										I-	105
COPPER PARAMINO BENZOATE													I-	105
COPPER 8-QUINOLINOLATE	S		210-D											
COPPER SALICYLATE														
COPPER SALTS														
COPPER SODIUM CITRATE														
COPPER SULPHATE (SEE CUPRIC SULPHATE)	S			1.0		4		300-K-LD50-ORL-RAT-4				300	I-	2270
COPPER TALLATE (SOAP)														
COPPER TARTRATE														
CORN OIL FATTY ACID														
CORN OIL	L		390-I										PI-	21779
COTTON DUST				0.2		1		10000 - TCLO-IHL-HMN-4						
CREOSOTE	L		200-M					600-K-LDLO-ORL-RBT-4	U- 0.031- 8					
CRESOLS	L	1-38.5	191-B	22		1		1000-K-LDLO-SKN-MUS-4					I-	685
O-CRESOL	L	1-38.2	190-B	22		1		1380-K-LD50-SKN-RBT-4	U- 1.15- 8					
P-CRESOL	L	1-53.0	201-B	22		1		301-K-LD50-SKN-RBT-4	R- 0.004- 6					
CROTONALDEHYDE	L		104-B					12 - TCLO-IHL-HMN-4	U- 0.18-10					
CRUFOMATE (ALSO RUELENE)				5		1		660-K-LD50-ORL-RAT-4				660		
CRYOLITE	S		1000-M	4.6		4		9-K-LDLO-ORL-RBT-4					I-	2478
CRYSTAL VIOLET								125-K-LDLO-ORL-RBT-4						
CUMENE	L	10-38.3	152-B	250		1		7000 - LCLO-IHL-MUS-4	U- 0.23- 7					
CUMENE HYDROPEROXIDE	L		153-B					1260 - LC50-IHL-RAT-4						
CUPRIC ACETATE	S		115-B											
CUPRIC AMMONIUM CHLORIDE														
CUPRIC CHLORIDE	S		490-M											
CUPRIC CITRATE (SEE COPPER CITRATE)	S													
CUPRIC DICHROMATE	S													
CUPRIC NITRATE	S		114.5-M											
CUPRIC SALICYLATE	S													
CUPRIC SULPHATE (SEE COPPER SULPHATE)	S			1.0		4		300-K-LD50-ORL-RAT-4				300	I-	2270

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-THA-CAR 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	ODOUR-INFO 14	15	PHY 16	17	O-RAT 18	QUANTITY 19	20
CYANIDES				5		1									
CYANOACETIC ACID	S		66-M												
1,CYANO-1,3-BUTADIENE															
CYANOCOBALAMINE															
CYANOGEN				22		1		35 - TDLO-IHL-HMN-4							
CYCLOBUTANE															
CYCLOHEXANE				1050		1		813-K-LDLO-ORL-MUS-4	U-	1204-10				U	48965
CYCLOHEXANOL				200		1		415 - TCLO-IHL-HMN-4							
CYCLOHEXANONE				200		1		204 - TCLO-IHL-HMN-4	D-	0.012- 6					
CYCLOHEXENE	L	160-38	83-B	1015		1									
CYCLOHEXYLAMINE	L		140-B	40		1		33000 - LCLO-IHL-RAT-4							
N-CYCLOHEXYL-2-BENZOTHIAZOLESULPHENAMIDE	S		94-M												
4-CYCLOHEXYL ISOCYANATE				0.11		1									
CYCLONITE	S		202-M												
CYCLOPENTADIENE	L		42.5-B	200		1		850-K-LD50-ORL-RAT-4					820		
CYCLOPENTANONE	L		130.5-B					2950-K-LD50-IPR-MUS-4							
CYCLOTETRAMETHYLAMINE-TETRANITRIMINE (HMX)															
O-CYMENE															
M-CYMENE															
P-CYMENE	L		175-B					28000 - LCLO-IHL-RAT-4							
CYMENE THIOCYANATE															
L-CYSTEINE	S														
2,4-D (SEE 2,4-DICHLOROPHENOXYACETIC ACIDS, HERBICIDES	S			10		1		80-K-LD50-ORL-HMN-4				P			
2,4-DB (SEE DICHLOROPHENOXYBUTYRIC ACID)								800-K-LD50-SKN-RAT-4							
DDT (SEE DICHLORODIPHENYLTRICHLOROETHANE, INSECTICIDES)	S		108.5-M	1		1		16-K-TDLO-ORL-HMN-4							
DECABORANE	S		99.7-M	0.3		1		64-K-LD50-ORL-RAT-4					64		
DECYL ALCOHOL	L	1-69.5	231-B					4720-K-LD50-ORL-RAT-4					4720		
DEHYDROABIETHYLAMINE ACETATE	S														
DEHYDROABIETHYLAMINE,ETHOXYLATED															
DEHYDROCHALIC ACID															
DEMETON (ALSO SYSTOX)				0.1		1		7-K-LD50-ORL-BWD-4							
DEOXYCHOLIC ACID															
DEXTRANASE															
DEXTRANS															
DEXTRIN								350-K-LD50-IVN-MUS-4						U-	4395
DEXTROSE HYDRATE															
DIACETONE ALCOHOL	L	1.1-20	167.9-B	240		1		4000-K-LD50-ORL-RAT-4	U-	5.23- 7			4000		
DI-(P-ACETOXYPHENYL)-2-PHYRIDYLMETHANE								3000-K-LDLO-ORL-RAT-4							
1,2-DIAMINOCYCLOHEXANE TETRA ACETIC ACID								150-K-LDLO-IPR-MUS-4							
2,4-DIAMINO-PHENOL DIHYDROCHLORIDE	L														
DI-N-AMYLAMINE	L		202-B					410 - LCLO-IHL-RAT-4							
DIAZEPAM								710-K-LD50-ORL-RAT-4					710		
DIAZOMETHANE	G		-23-B	0.34		1		272-K-LCLO-IHL-RAT-4							
DIBENZOTHIAZYL-DISULPHIDE	S		180-M												
DIBENZOYLHYDRAZINE															
DIBORANE	G	224-(-112)	-92.5-B	0.1		1		183 - LC50-IHL-HMN-4							
2,4-DIBROMOANISOL															
2,5-DIBROMO-3-NITROSALICYLANILIDE															
4,5-DIBROMO-3-NITROSALICYLANILIDE															
2,3-DIBROMO-1-PROPANOL															
DI-N-BUTYLAMINE	L	2-220	159-B					2690 - LCLO-IHL-RAT-4	U-	1.43-12					
DI-SEC-BUTYLAMINE	L		134-B												

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5	6	7	TOXIC-TEST-DATA 8	9	10	11	12	13	ODOUR-INFO 14	15	16	PHY 17	O-RAT 18	QUANTITY 19	20
DIBUTYL AMINOETHANOL	L		222-B	14		1		1070-K-LD50-ORL-RAT-4										1070		
DIBUTYL FUMARATE	L		285-B																	
1,3-DIBUTYLTHIOUREA	S		60-M					200-K-LDLO-IPR-MUS-4												
DIBUTYL MALEATE	L		-281-B					150-K-LDLO-IPR-MUS-4												
NN'DI-SEC-BUTYL-PARA-PHENYLENE DIAMINE	L																			
DIBUTYL PHOSPHATE	L			5		1		3200-K-LD50-ORL-RAT-4										3200		
DIBUTYL PHTHALATE	L		340-B	5		1		140-K-TDLO-ORL-HMN-4											U-	320
DIBUTYL SEBACATE	L		180-B																	
DIBUTYL TIN DILAURATE	S		27-M					243-K-LD50-ORL-RAT-4										243		
1,3-DIBUTYLTHIOUREA	S		60-M																	
DIBUTYL XANTHOGEN DISULPHIDE																				
DICALCIUM SILICATE																				
DICAPRYL PHTHALATE	L		222-B																	
DICHLONE (SEE 2,3-DICHLORO-NAPTHOQUINONE, HERBICIDES,FUNGICIDES)	S		193-M					1300-K-LD50-ORL-RAT-4										1300		
DICHLORAPHENAZONE																				
DICHLOROACETYLENE				0.4		1		1.9 - TCLO-IHL-HMN-4												
O-DICHLOROBENZENE	L		180-B	300		1		500-K-LD50-ORL-RAT-4										500		
P-DICHLOROBENZENE	S	10-54.8	53-M	450		1		300-K-LDLO-ORL-HMN-4											U-	740
3,3-DICHLOROBENZIDINE	S		1133-M	CAR		1	C	4740-K-LDLO-ORL-RAT-4												
2,6-DICHLOROBENZINE ACID																				
2,4-DICHLORO-BENZYL-NICOTINIUM CHLORIDE																				
DICHLORODIFLUOROMETHANE (ALSO FREON 12)	G	5A-16.1	-29-B	4950		1														
3,6-DICHLORO-2,5-DIMETHOXYBENZOQUINONE																				
1,3-DICHLORO-5,5-DIMETHYL HYDANTOIN	S		132-M	0.2		1		542-K-LD50-ORL-RAT-4										542		
DICHLORODIPHENYLDICHLOROETHANE (SEE TDE)	S		110-M																	
DICHLORODIPHENYLTRICHLOROETHANE (SEE DDT, INSECTICIDES)	S		108.5-M	1		1		16-K-TDLO-ORL-HMN-4												
1,1-DICHLOROETHANE (SEE ETHYLIDENE CHLORIDE)								725-K-LD50-ORL-RAT-4												
1,2-DICHLOROETHANE (SEE ETHYLENE DICHLORIDE)								16500 - TCLO-IHL-HMN-4						D-	4.30-	6				
1,2-DICHLOROETHYLENE	L	400-41	59-B	790		1		770-K-LD50-ORL-RAT-4										770		
DICHLORO ETHYL ETHER	L	0.7-20	178.5-M	30		1		5950 - LCLO-IHL-RAT-4												
DICHLOROMETHANE (SEE METHYLENE CHLORIDE)	L	380-22	40.1-B	890		1		10500 - TCLO-IHL-HMN-4											U-	915
4,4-DICHLORO-ALPHA-METHYL BENZHYDROL								500-K-LD50-ORL-RAT-4										500		
1,1-DICHLORO-METHYL METHYL ETHER																				
2,3-DICHLORO-NAPTHOQUINONE (SEE DICHLONE)	S		193-M					1300-K-LD50-ORL-RAT-4										1300		
1,4-DICHLORO-2-NITROBENZENE	L																			
1,1-DICHLORO-1-NITROETHANE	L		124-B	60		1		150-K-LDLO-ORL-RBT-4												
2,5-DICHLORO-4-NITROPHENOL																				
3,4-DICHLORO-2-NITROSALICYLANILIDE								15-K-LDLO-IPR-MUS-4												
2,4-DICHLOROPHENOXYACETIC ACID (SEE 2,4-D , HERBICIDES)	S			10		1		80-K-LD50-ORL-HMN-4									P			
DICHLOROPHENOXYBUTYRIC ACID (SEE 2,4-DB)								800-K-LD50-SKN-RAT-4												
DI (P-CHLOROPHENYL) METHYL CARBINOL								500-K-LD50-ORL-RAT-4										500		
1,2-DICHLOROPROPANE (SEE PROPYLENE DICHLORIDE)	L	40-19.4	96.8-B	350		1		9400 - LCLO-IHL-RAT-4												
1,3-DICHLOROPROPENE	L		103-B																	
DICHLOROTETRAFLUOROETHANE	L		124-B	7000		1														
2,5-DICHLOROTHIOPHENE																				
DICYANDIAMIDE	S		208-M					300-K-LD50-IPR-RBT-4												
DICYCLOHEXYLAMINE	L		256-B					373-K-LD50-ORL-RAT-4										373		
DICYCLOHEXYL ADIPATE																				
DICYCLOHEXYL PHTHALATE	S	0.1-150	58-M																	
DICYCLOPENTADIENYL IRON	S		174-M	10		1		1180-K-LD50-ORL-RAT-4										1180		
DIELDRIN (SEE INSECTICIDES)	S		150-M	0.25		1		20-K-LD50-ORL-CKN-4												

COMPOUND NAME	PHYSICAL-PROPERTIES			TLV-TWA-CAR				TOXIC-TEST-DATA	ODOUR-INFO			PHY	O-RAT	QUANTITY	
	1	2	3	4	5	6	7	8 9 10 11 12 13	14	15	16	17	18	19	20
DIETHANOLAMINE	L	5-136	269,1-3					710-K-LD50-ORL-RAT-4					710	U-	800
DIETHANOLAMINE LAURYL ETHER SULPHATE															
DIETHYLALUMINUM CHLORIDE	L		209-3												
DIETHYLAMINE	L	400-38	55,5-3	75		1		14800 - LC50-IHL-RAT-4	U-	1.82-12					
ALPHA-DIETHYLAMINOACETO-2,6-XYLIDIDE								25-K-LDLO-IVN-RAT-4							
DIETHYLAMINOBARBITAL															
DIETHYLAMINOETHANOL (SEE DIETHYLETHANOLAMINE)	L	1.4-20	162-3	50		1		1260-K-LD50-SKN-RBT-4							
DIETHYLAMINOHYDROCHLORIDE															
2,5-DIETHYL-3,5-DINITROBENZANILIDE															
DIETHYLENE DIOXIDE	L	40-25.2	101,1-3	180		1		1725 - LCLO-IHL-HMN-4	U-	6.50-12					
DIETHYLENE GLYCOL	L	1-91.8	245,6-3					2000-K-LDLO-IVN-RBT-4						U-	975
DIETHYLENE GLYCOL MONOBUTYL ETHER	L	0,02-20	230,6-3					2000-K-LD50-ORL-GPG-4							
DIETHYLENE GLYCOL MONOETHYL ETHER	L		201,9-3					3620-K-LD50-ORL-RBT-4	U-	6.00- 7					
DIETHYLENE GLYCOL MONOMETHYL ETHER	L	0.12-20	209,1-3					4160-K-LD50-ORL-GPG-4							
DIETHYLENE GLYCOL MONOSTEARATE								200-K-LDLO-IPR-MUS-4							
DIETHYLENE TRIAMINE	L	0,22-20	207-3	4		1		170-K-LD50-SKN-GPG-4							
DIETHYLETHANOLAMINE (SEE DIETHYLAMINOETHANOL)	L	1.4-20	162-3	50		4		1260-K-LD50-SKN-RBT-4	U-	0.19- 6					
DIETHYL ETHER (SEE ETHYL ETHER)	L	442-20	34,6-3	1200		1		2200-K-LD50-ORL-RAT-4	D-	2.10- 6			2200		
DI(2-ETHYLHEXYL) ADIPATE	L	2.6-200	214-3												
DI(2-ETHYLHEXYL) AZELATE	L		237-3												
DI(2-ETHYLHEXYL) PHTHALATE	L	1.2-200	23[illegible]-3	5		1		143-K-TDLO-ORL-HMN-4							
DI(2-ETHYLHEXYL) SEBECATE	L		248-3												
DIETHYL NITROSAMINE								365-K-TDLO-IHL-HAM-4							
DIETHYLSTILBESTROL															
N,N-DIETHYL-META-TOLUAMIDE															
DIETHYL PHTHALATE (DEP)	L	14-163	298-3	5		1		2749-K-LD50-IPR-MUS-4							
1,3-DIETHYLTHIOUREA								316-K-LD50-ORL-RAT-4					316		
DIFLUORODIBROMOMETHANE	L		23,2-3	860		1		19700 - LCLO-IHL-RAT-4							
DIGLYCOLIC ACID	S		148-4												
DIGLYCOL LAURATE	L		315-3												
DIGLYCOL OLEATE															
DI(HEXYL,OCTYL,DECYL) PHTHALATE															
DI(HEXYL,OCTYL,DECYL) TRIMETELLIATE															
2,3-DIHYDRO-5-CARBOXANILIDO-6-METHYL- -1,4-OXATHIIN-4,4-DIOXIDE								2000-K-LD50-ORL-RAT-4					2000	U-	175
DIHYDROXYALUMINUM AMINOACETATE															
M-DIHYDROXY BENZENE (SEE RESORCINOL)	S	1-108,4	110-4	2		1		301-K-LD50-ORL-RAT-4					301		
3-ALPHA,6-ALPHA DIHYDROXYPREGNAB-20-ONE															
DIISOBUTYL ADIPATE															
DIISOBUTYLAMINE	L	10-30,6	139.6-3					258-K-LD50-UNK-RAT-4							
DIISOBUTYLENE	L		102-3												
DIISOBUTYL KETONE	L		166-3	150		1		11800 - LD50-IHL-RAT-4	U-	1.80- 7					
DIISOCYANATES														I-	2235
DIISODECYL ADIPATE	L		240-3												
DIISODECYL PHTHALATE	L														
DIISOOCTYL ADIPATE	L		207-3												
DIISOOCTYL AZELATE	L		235-3												
DIISOOCTYL PHTHALATE	L		230-3												
DIISOOCTYL SEBECATE	L		246-3												
DIISOPROPYLAMINE	L		83-3	20		1		4210 - LCLO-IHL-RAT-4	U-	1.57- 7					
N,N-DIISOPROPYL-P-PHENYLENEDIAMINE															
N,N-DIMETHYL ACETAMIDE	L	1.3-25	165-3	35		1		565-K-LD50-ORL-RAT-4	U-	166.00- 8			565		
DIMETHYLAMINE	G		6,9-3	18		1		698-K-LD50-ORL-RAT-4	R-	0.09- 6			698		
DIMETHYLAMINO BENZALDEHYDE	S		73-4												

COMPOUND NAME	PHYSICAL-PROPERTIES			TLV-TWA-CAR				TOXIC-TEST-DATA	ODOUR-INFO			PHY	O-RAT		QUANTITY
	1	2	3	4	5	6	7	8 9 10 11 12 13	14	15	16	17	18	19	20
DIMETHYLAMINOAZOBENZENE	S		116-M	CAR		1	C	2030-K-LD50-ORL-RAT-4					2030		
DIMETHYLAMINOETHANOL	L		131-3					1370-K-LD50-SKN-RBT-4							
N,N-DIMETHYLANILINE	L	1-29.5	193.1-B	25		1		1410-K-LDLO-ORL-RAT-4							
N-(1,3-DIMETHYLBUTYL)N-PHENYL-PARA- -PHENYLENEDIAMINE															
DIMETHYLCYCLOHEXYL PHTHALATE															
3,4-DIMETHYL-3,4-DIPHONYLHEXANE															
DIMETHYL DISTEARYL AMMONIUM CHLORIDE															
DIMETHYL DISULPHIDE	L	28.6-25	110-B						U-	0.03-	8				
O,O-DIMETHYL DITHIOPHOSPHATE															
N,N-DIMETHYLFORMAMIDE	L	3.7-25	152.8-B	30		1		60 - TCLO-IHL-HMN-4	U-	300-	8				
1,1-DIMETHYLHYDRAZINE	L	157-25	63.3-B	1		1		122-K-LD50-ORL-RAT-4					122		
3,5-DIMETHYLISOXAZOLE															
4,5-DIMETHYL-2-MERCAPTOTHIAZOLE															
2,3-DIMETHYL-3-NITROSALICYLANILIDE															
2,4-DIMETHYL-3-NITROSALICYLANILIDE															
2,5-DIMETHYL-3-NITROSALICYLANILIDE															
2,6-DIMETHYL-3-NITROSALICYLANILIDE															
DIMETHYLOLHYDROXYETHYLENE UREA															
DIMETHYL OXALATE															
DIMETHYLPHTHALATE	L	1-100	284-B	5		1		1580-K-LD50-IPR-MUS-4							
DIMETHYL SULPHATE	L		188-B	5		1	C	168 - LCLO-IHL-RAT-4							
DIMETHYL SULPHIDE	L		188-B					3300-K-LD50-ORL-RAT-4	U-	0.0025-	8		3300		
DIMETHYL SULPHOXIDE	L	0.37-20	100-D												
N-N-DIMETHYLTHIOUREA															
1,3-DIMETHYL UREA															
2,4-DINITROANILINE	S		180-M					418-K-LD50-ORL-RAT-4					418		
3,5-DINITROBENZANILIDE															
P-DINITROBENZENE	S		118-M	1		1		27-K-LDLO-ORL-CAT-4							
3,5-DINITRO-O-BENZOTOLUIDIDE															
3,5-DINITRO-2,3-BENZOXYLIDIDE															
DINITRO-6-SEC-BUTYLPHENOL	S							25-K-LD50-ORL-RAT-4					25		
2,6-DINITRO-4-CHLOROPHENOL															
P-DINITROCRESOL	S							24.8-K-LD50-IPR-MUS-4							
3,5-DINITRO-O-CRESOL				0.2		1		1 - TCLO-IHL-HMN-4							
4,6-DINITRO-O-CRESOL ACETATE															
4,6-DINITRO-O-CRESOL METHYL ETHER								100-K-LDLO-ORL-MUS-4							
DINITRO-O-CYCLOHEXYLPHENOL	S														
2,4-DINITROPHENOL (SEE BIOCIDES)	S		112-M					30-K-LD50-ORL-RAT-4					30		
2,4-DINITROPHENOLHYDRAZINE															
2,4-DINITROPHENOL SODIUM SALT															
4,3-DINITROSALICYLANILIDE								25-K-LDLO-IPR-MUS-4							
2,3-DINITRO-P-SALICYLOTOLUIDIDE															
3,5-DINITRO-O-SALICYLOTOLUIDIDE															
2,4-DINITROTHYMOL															
3,5-DINITRO-O-TOLUAMIDE	S		177-M	5		1		560-K-LD50-ORL-RAT-4					560		
2,4-DINITROTOLUENE	S		69.5-M	1.5		1		268-K-LD50-ORL-RAT-4					268		
P,P-DINONYL DIPHENYLAMINE															
DINONYL PHTHALATE															
DI(N-OCTYL,N-DECYL) ADIPATE															
DI(N-OCTYL,N-DECYL) PHTHALATE	L		232-B												
P,P-DIOCTYL DIPHENYLAMINE															
DIOCTYL PHTHALATE	L	1.2-200	230-B	5		1		15000-K-LDLO-IPR-RAT-4							
DIOCTYL SULPHOSUCCINATE															

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	ODOUR-INFO 14	15	16	PHY 17	O-RAT 18	QUANTITY 19	20
DIPHENYL	S		70-M	1	1			2180-K-LD50-ORL-RAT-4					2180		
DIPHENYLAMINE	S	1-108.3	52.9-M	10	1										
DIPHENYL MERCURY DODECENYL SUCCINATE															
N,N'-DIPHENYL-PARA-PHENYLENEDIAMINE	S														
DI-N-PROPYLAMINE	L		105-B						U-	0.41- 7					
DIPROPYLENE GLYCOL	L	1-73.8	231.8-B											U-	60
DISALICYLALPROPYLENEDIIMINE	L		-23.3-M												
DISODIUM DIHYDROXY ETHYL GLYCINE															
DISODIUM ETHYLENE BISDITHIOCARBAMATE	S							395-K-LD50-ORL-RAT-4					395		
DISODIUM NITRILOTRIACETATE								1460-K-LD50-ORL-RAT-4					1460		
DISODIUM OCTOBORATE TETRAHYDRATE															
DITHIAZANINE IODIDE															
DITRIDECYL PHTHALATE			285-B												
DIVINYL BENZENE	L	1-32.7	199.5-B												
DODECYLACETAMIDO-DIMETHYL BENZYLAMMONIUM CHLORIDE								2000-K-LD50-ORL-RAT-4					2000		
DODECANEDIOIC ACID															
DODECYLBENZENE	L		290-B												
DODECYLBENZENE SULPHONIC ACID															
6-DODECYL-1,2-DIHYDRO-2,2,4-TRIMETHYLQUINOLINE															
DODECYL MERCAPTAN	L		115-B												
DODECYL PHENOL	L		154-B					2140-K-LD50-ORL-RAT-4					2140		
DRIPOLENE															
ENDRIN (SEE INSECTICIDES)				0.1	1			3-K-LD50-ORL-RAT-4					3		
EPICHLOROHYDRIN	L	10-16.6	117.9-B	19	1			18.5 - TDLO-IHL-MUS-4							
ETHANE	G		-88.6-B												
ETHANOL (SEE ETHYL ALCOHOL)	L	40-19	78.3-B	1900	1			50-K-LDLO-ORL-HMN-4	U-	3.60-10				U-	12765
ETHANOLAMINES	L	6-60	170.5-B	6	1									AS-	9648
6-ETHOXY-1,2-DIHYDRO-2,2,4-TRIMETHYLQUINOLINE	L		125-B					800-K-LD50-ORL-RAT-4					800		
ETHOXY TRIGLYCOL		0.01-20													
ETHYL ACETATE				1400	1			5865 - LC50-IHL-RAT-4	D-	6.00- 6				U-	98160
ETHYL ACRYLATE				100	1			5000 - LCLO-IHL-RBT-4	R-	0.0012- 7				U-	730
ETHYL ALCOHOL (SEE ETHANOL)	L	40-19	78.3-B	1900	1			50-K-LCLO-ORL-HMN-4		3.60-10				U-	12765
ETHYL ALUMINUM SESQUICHLORIDE	L														
ETHYL AMINE	L	400-2	16.6-B	18	1			5600 - LCLO-IHL-RAT-4	U-	1.53- 7					
ETHYL AMYL KETONE	L		160-B	130	1			2800-K-LD50-ORL-RAT-4					2800		
ETHYL BENZENE	L	10-25.9	136-B	435	1			880 - TDLO-OCU-HMN-4							
ETHYL BROMIDE	L	400-21	38.4-B	890	1			9800 - LCLO-IHL-GPG-4							
ETHYL BUTYL KETONE	L		148-B	230	1			2760-K-LD50-ORL-RAT-4					2760		
ETHYL CHLORIDE	L	1000-20	12.3-B	2600	1			34900 - TCLO-IHL-HMN-4						U-	13455
ETHYLENE CHLOROHYDRIN	L	10-30	120-B	16	1			71-K-LD50-ORL-RAT-4					71		
ETHYL DIETHANOLAMINE	L		240-B												
ETHYLENE	G		-103-B						U-	460.00- 7				P-	448064
ETHYLENE CYANOHYDRIN	L	0.08-25	228-B					500-K-LDLO-IPR-MUS-4							
ETHYLENE DIAMINE	L	10.7-20	117-B	25	1			500 - TCLO-IHL-HMN-4	U-	8.40- 7					
ETHYLENE DIAMINETETRAACETIC ACID (ALSO EDTA)	S		240-D					2000-K-LD50-ORL-RAT-4					2000		
ETHYLENE DIBROMIDE	L	17.4-30	131.4-B	145	1			3050 - LCLO-IHL-GPG-4						I-	8615
ETHYLENE DICHLORIDE (SEE 1,2-DICHLOROETHANE)	L	100-29.4	83.5-B	200	1			16500 - TCLO-IHL-HMN-4	U-	4.30-10					
ETHYLENE GLYCOL	L	0.05-20	197.5-B	250	1			1500-K-LDLO-ORL-HMN-4						U-	17210
ETHYLENE GLYCOL DINITRATE				1.2	1			616-K-LD50-ORL-RAT-4					616		
ETHYLENE GLYCOL MONOBUTYL ETHER	L	0.6-20	171.2-B	245	4			950 - TDLO-IHL-HMN-4	U-	1.70- 7				U-	550
ETHYLENE GLYCOL MONOETHYL ETHER	L	3.[illegible]-20	131.1-B	370	1			8780 - LCLO-IHL-MUS-4	U-	2.60- 7					
ETHYLENE GLYCOL MONOETHYL ETHER ACETATE	L	1.2-20	156.4-B	540	1			6245 - LCLO-IHL-RAT-4	U-	0.75- 7					
ETHYLENE GLYCOL MONOMETHYL ETHER ACETATE	L		143-B	25	1			2460-K-LD50-ORL-RAT-4	U-	3.10- 7			2460		

COMPOUND NAME	PHYSICAL-PROPERTIES			TLV-TWA-CAR				TOXIC-TEST-DATA	ODOUR-INFO	PHY O-RAT	QUANTITY	
	1	2	3	4	5	6	7	8 9 10 11 12 13	14 15 16 17	18	19	20
ETHYLENE OXIDE	G	1095-20	10.7-B	90		1		7300 - LC50-IHL-HMN-4	U-500.00- 7		U-	15675
ETHYLENE THIOUREA							C	656-K-LDLO-ORL-RAT-4				
ETHYLENIMINE	L	160-20	55-B	1		1	C	110 - LCLO-IHL-RAT-4				
N-ETHYLETHANOLAMINE	L	0.4-20	167-B									
ETHYL ETHER (SEE DIETHYL ETHER)	L	442-20	34.6-B	1200		1		2200-K-LD50-ORL-RAT-4	U- 0.70-10	2200		
ETHYL FORMATE	L	100-5.4	54.3-B	300		1		1850-K-LD50-ORL-RAT-4		1850		
2-ETHYL-1,3-HEXANEDIOL	L	0.01-20	243.1-B					1400-K-LD50-ORL-CKN-4				
2-ETHYLHEXANOL (SEE 2-ETHYLHEXYL ALCOHOL)	L	0.2-20	179-B					800-K-LD50-ORL-RAT-4	U- 0.73-12	800	U-	30
2-ETHYLHEXYL ACRYLATE	L	1-50	130-B						U- 1.43- 7		U-	210
2-ETHYLHEXYL ALCOHOL (SEE 2-ETHYLHEXANOL)	L	0.2-20	179-B					800-K-LD50-ORL-RAT-4		800	U-	30
1-(2-ETHYLHEXYL)-2-UNDECYL-1,4,5,6-TETRA-HYDROPYRIMIDINE												
ETHYLIDENE CHLORIDE (SEE 1,1-DICHLOROETHANE)	L	230-25	57.3-B	400		1		725-K-LD50-ORL-RAT-4		725		
ETHYLIDENE NORBORNENE				25		1		2830-K-LD50-ORL-RAT-4	U- 0.36- 7	2830		
ETHYL MERCAPTAN	L		36.2-B	1.2		1		10 - TCLO-IHL-HMN-4	U-.00004- 5			
ETHYLMERCURIC CHLORIDE	S		192.5-M	0.01		4		30 - LCLO-IHL-MUS-4				
ETHYL N-MORPHOLINE	L		138-B	94		1		1780-K-LD50-ORL-RAT-4		1780		
2-ETHYL-3-NITRO-SALICYLANILIDE												
ETHYLNITROSONITROGUANIDINE							C	660-K-TDLO-SKN-MUS-4				
O-ETHYL-S-PENTACHLOROPHENYL THIOCARBAMATE												
ETHYL PHTHALATE	L		302-B					1232-K-TDLO-IPR-MUS-4				
2-ETHYL-3-PROPYL ACROLEIN	L	1-20	175-B					3000-K-LD50-ORL-RAT-4		3000		
ETHYL SILICATE	L	1-20	165.5-B	850		1		8500 - LCLO-IHL-RAT-4				
FERRIC CHLORIDE (ANHYDROUS)	S	1-194	282-M					900-K-LD50-ORL-RAT-4		900		
FERRIC NITRATE	S		35-M									
FERRIC OXIDE	S		1565-M									
FERRIC SULPHATE (ANHYDROUS)	S		480-D									
FERROCHROME											I-	22943
FERROMANGANESE											I-	19721
FERROPHOSPHORUS												
FERROSILICON	S											
FERROUS CHLORIDE (ANHYDROUS)	S	10-700	670-M									
FERROUS DISODIUM VERSENATE												
FERROUS FUMARATE	S		280-M								I-	10446
FERROUS OXIDE	S		1420-M	10		1						
FERROUS PHOSPHIDE												
FERROUS PHOSPHOGLUCONATE												
FERROUS SULPHATE	S							1170-K-LD50-ORL-MUS-4				
FERROUS SULPHIDE	S		1193-M									
FERROUS SULPHITE												
FERROVANADIUM DUST	S		2750-M	1		1						
FIBROUS GLASS DUST	S			10		1						
FISH OIL	L		420-F								UE-	23491
FLUOBORIC ACID	L		130-D									
FLUORIDES (AS F)				2.5		1						
FLUORINE	G		-187-B	0.2		1		39 - TCLO-IHL-HMN-4				
2-FLUORO-3-NITROSALICYLANILIDE												
3-FLUORO-3-NITROSALICYLANILIDE												
3-FLUORO-5-NITROSALICYLANILIDE												
4-FLUORO-3-NITROSALICYLANILIDE								15-K-LDLO-IPR-MUS-4				
4-FLUORO-5-NITROSALICYLANILIDE												
FLUOROTRICHLOROMETHANE	L		24.1-B	5600		1						
FLUOSILICIC ACID	L							200-K-LDLO-ORL-GPG-4			U-	2650
FORMALDEHYDE (SEE FUNGICIDES)	G		-20-B	2.5		1		17 - TCLO-IHL-HMN-4	D- 1.27- 6		P-	63802

	COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	ODOUR-INFO 14 15	PHY 16	17	C-RAT 18	19	QUANTITY 20
1	FORMAMIDE	L	29.7-129	210.7-P	30		1		2539-K-LD50-INS-GPG-4	D-300,00- 6					
2	FORMIC ACID	L	40-24	100.8-B	9		1		1100-K-LD50-ORL-MUS-4	D-450000- 6					
3	FUMARIC ACID	S		287-M					200-K-LD50-IPR-MUS-4					I-	960
4	FURALTADONE													I-	1040
5	FURAZOLIDONE	S		255-M					11-K-TDLO-ORL-HMN-4						
6	FURFURAL	L		161.7-B	20		1		610-K-LCLO-IHL-RAT-4						
7	FURFURAL RESINS														
8	FURFURANE	L		31.4-B											
9	FURFURYL ALCOHOL				20		1		1020 - LCLO-IHL-RAT-4						
10	D-GALACTOSAMINE HYDROCHLORIDE														
11	D-GALACTOSE PENTAACETATE														
12	GASOLINE (UNLEADED)	L		257-I											
13	GELATINE														
14	GERMANIUM HYDRIDE	L		29-B	0.6		1								
15	D-GLUCAL														
16	D-GLUCAL TRIACETATE														
17	D-GLUCOSAMINE HCL														
18	GLUCOSE	L													
19	D-GLUCOSE PENTAACETATE													U-	1610
20	GLUTARIC ACID	S		97-M											
21	GYCERINE	L	.003-50	290-B					7750-K-LD50-ORL-GPG-4						
22	GYCEROL													U-	11090
23	GYCEROL MONOOLEATE	S		14-M											
24	GYCEROL MONOSTEARATE	S		58-M					200-K-LDLO-IPR-MUS-4						
25	GYCEROL SORBITAN LAURATE														
26	GYCERYL TRIACETATE	L		258-B					150-K-LCLO-ORL-FRG-4						
27	GYCERYL TRINITRATE	L	1-127	260-E	2		1		80-K-LDLO-ORL-RAT-4						
28	GYCERYL TRISTEARATE	S		71.6-B					1330-K-TDLO-SCU-MUS-4						
29	GLYCIDOL	L		162-D	150		1		850-K-LD50-ORL-RAT-4				850		
30	GLYCINE	S		232-B											
31	GOLD CYANIDE	S		-D											
32	GOLD OXIDE	S		160-M											
33	GOLD POTASSIUM BROMIDE	S													
34	GOLD POTASSIUM CYANIDE	S													
35	GOLD SODIUM CHLORIDE	S													
36	GOLD SODIUM CYANIDE														
37	GOLD TRICHLORIDE (SEE CHLORAURIC ACID)								1500-K-LDLO-SCU-MUS-4						
38	GONADOTROPIN														
39	GRAPHITE	S			15	*	1								
40	GUANIDINE NITRATE	S		214-M											
41	GUTHION	S		74-M	0.2		1		300-K-LD50-SKN-RAT-4						
42	HAFNIUM	S		2207-M	0.5		1								
43	HELIUM	G		-256-B											
44	HEPARIN POTASSIUM	S													
45	HEPARIN SODIUM	S							420-K-LDLO-IPR-RAT-4						
46	HEPTACHLOR (SEE INSECTICIDES)	S		95-M	0.5		1		40-K-LD50-ORL-RAT-4				40		
47	HEPTANE	L	40-22.3	98-B	2000		1		4160 - TCLO-IHL-HMN-4	U-900.00- 8					
48	HEPTENE	L		96-B											
49	HEXACHLOROCYCLOPENTADIENE	L		239-B	0.01		1		505-K-LD50-ORL-RAT-4				505		
50	HEXACHLOROETHANE	S	1-32.7	186.6-S	9.7		1		325-K-LDLO-IVN-DOG-4						
51	HEXACHLORONAPHTHALENE	S			0.2		1								
52	HEXACHLOROPHENE	S		151-M					0.043-K-TDLO-ORL-HMN-4						
53	HEXAETHYLTETRAPHOSPHATE	L		150-D					15-K-LDLO-SKN-RAT-4						
54	HEXAFLUOROACETONE	G			0.7		1		191-K-LD50-ORL-RAT-4				191		

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5 6 7	TOXIC-TEST-DATA 8 9 10 11 12 13	ODOUR-INFO 14 15	PHY O-RAT 16 17 18	QUANTITY 19 20
HEXAFLUOROAZOMETHANE									
HEXAMETHYLENEDIAMINE	S		42-M						I- 2
HEXAMETHYLENEIMINE	L		133-B			33-K-LD50-ORL-RAT-4		33	
HEXAMETHYLENETETRAMINE	S		280-M			512-K-LDLO-IPR-MUS-4			I- 265
HEXAMINE	S		280-M			512-K-LDLO-IPR-MUS-4			
HEXANE	L	100-15.8	68.7-B	1800	1	5000 - TCLO-IHL-HMN-4			
2-HEXANONE (ALSO METHYL N-BUTYL KETONE)	L	10-38.8	127.2-B	410	1	2590-K-LD50-ORL-RAT-4		2590	
S-HEXYL ACETATE	L	3.9-20	146.5-B	300	1	24000 - LCLO-IHL-RAT-4			
HEXYLENE GLYCOL	L	0.05-20	197.1-B			3696-K-LD50-ORL-RAT-4		3696	U- 240
HEXYLNITROSONITROGUANIDINE									
HYDRAZINE	L		1[illegible]-B	1.3	1	710 - LC50-IHL-RAT-4			
HYDRAZINE SULPHATE	S		85-M			601-K-LD50-ORL-RAT-4		601	
HYDROBROMIC ACID	G		-66.3-B	10	1	16.8 - TCLO-IHL-HMN-4			
HYDROCHLORIC ACID	G	4A-17.8	-85-B	7	1	1000 - LCLO-IHL-MAN-4	R- 15.00- 6		
HYDROCYANIC ACID	L	400-9.8	25.7-B	11	1	5600 - LCLO-IHL-HMN-4	D- 1.00- 6		
HYDROFLUORIC ACID	L	400-2.5	19.4-B	2	1	26 - TCLO-IHL-HMN-4	U- 0.03- 8		
HYDROGEN	G		-252-B						I- 10670
HYDROGEN BROMIDE (SEE HYDROBROMIC ACID)	G		-66.5-B	10	1	16.8 - TCLO-IHL-HMN-4			
HYDROGEN CHLORIDE (SEE HYDROCHLORIC ACID)	G	4A-17.8	-85-B	7	1	1000 - LCLO-IHL-MAN-4	R- 15.00- 6		P- 70175
HYDROGEN CYANAMIDE	S		42-M						
HYDROGEN CYANIDE (SEE HYDROCYANIC ACID)	L	400-9.8	25.7-B	11	1	5600 - LCLO-IHL-HMN-4	D- 1.00- 6		
HYDROGEN FLUORIDE (SEE HYDROFLUORIC ACID)	L	400-2.5	19.4-B	2	1	26 - TCLO-IHL-HMN-4	U- 0.03- 8		U- 4795
HYDROGEN PEROXIDE	L	1-15.3	107-B	1.4	1				
HYDROGEN SELENIDE	G	10A-23.4	-41.4-B	0.2	1	0.65 - TCLO-IHL-HMN-4	U- 1.00-2		
HYDROGEN SULPHIDE	G	20A-25.5	-60.4-B	15	1	950 - LC50-IHL-MUS-4	O-.00025- 6		
HYDROQUINONE (ALSO RESORCINOL)	S	1-132.4	173-M	2	1	370-K-LC50-ORL-RAT-4		370	
HYDROQUINONE DIACETATE									
HYDROQUINONE MONOBENZYL ETHER	S					4500-K-LD50-IPR-RAT-4			
HYDROQUINONE MONOMETHYL ETHER	S		52.5-M			1600-K-LD50-ORL-RAT-4		1600	
HYDROXYACETIC ACID	S		65-M			500-K-LCLO-ORL-CAT-4			
2-HYDROXYACETOPHENONE	L		53-M						
M-HYDROXYBENZOIC ACID									
O-HYDROXYBENZOIC ACID (SEE SALICYIC ACID)	S	1-113.7	159-M			1000-K-LDLO-SCU-RAT-4			
P-HYDROXYBENZOIC ACID									
2-HYDROXYETHYL METHACRYLATE	L		-12-M			528-K-LD50-IPR-MUS-4			
HYDROXYLAMINE HCL (SEE HYDROXYLAMMONIUM CHLORIDE)	S		151-M			400-K-LD50-ORL-MUS-4			
HYDROXYLAMMONIUM BENZOATE									
HYDROXYLAMMONIUM CHLORIDE (SEE HYDROXYLAMINE HCL)	S		151-M			400-K-LD50-ORL-MUS-4			
HYDROXYLAMMONIUM PHOSPHATE									
HYDROXYLAMMONIUM SULPHATE	S		177-M						
2-HYDROXYPHENAZINE-1-CARBOXYLIC ACID									
P-HYDROXYPHENYLGLYCINE									
HYDROXYPROPYL METHACRYLATE									
HYDROXYPROPYL STARCH									
8-HYDROXYQUINOLINE	S		76-M			1200-K-LD50-ORL-RAT-4		1200	
12-HYDROXYSTEARIC ACID						160-K-TDLO-SCU-MUS-4			
HYPODESOXYCHOLIC ACID									
HYPOPHOSPHORUS ACID	S		26.5-M						
IMIDAZOLINE						53-K-LD50-IPR-MUS-4			
INDENE	L		182-B	45	1	1000-K-LDLO-SCU-RAT-4			
INDIUM AND COMPOUNDS	S		157-M	0.1	1	4200-K-LD50-ORL-RAT-4		4200	
INDIUM SULPHATE						13-K-LDLO-SCU-RAT-4			

COMPOUND NAME	PHYSICAL-PROPERTIES			TLV-TWA-CAP				TOXIC-TEST-DATA	ODOUR-INFO				PHY	O-RAT	QUANTITY
	1	2	3	4	5	6	7	8 9 10 11 12 13	14	15	16	17	18	19	20
INVERTASE															
IODINE	S	1-38.7	112.9-M	1		1		2000-K-LDLO-ORL-HMN-4						I-	200
IODOACETIC ACID								116-K-LD50-ORL-MUS-4							
4-IODO-3,5-DINITROBENZANILIDE															
2-IODO-3-NITROSALICYLANILIDE															
3-IODO-3-NITROSALICYLANILIDE								15-K-LDLO-IPR-MUS-4							
4-IODO-3-NITROSALICYLANILIDE								15-K-LDLO-IPR-MUS-4							
4-IODO-5-NITROSALICYLANILIDE															
M-IODOPHENOL															
O-IODOPHENOL								4000-K-LDLO-SCU-RAT-4							
P-IODOPHENOL															
[illegible]-IODOSUCCINATE															
IRIDIUM	S		24[illegible]0-M												
IRON BLUE														U-	55
IRON 2-ETHYLHEXOATE															
IRON DEXTRAN								2500-K-LDLO-IPR-RAT-4							
IRON NAPHTENATE															
IRON OXIDE (FUME)	S		1420-M	5		1								UE-	73460
IRON PENTACARBONYL	L	40-30.3	105-B	0.08		1		7 - LCLO-IHL-MUS-4							
IRON SALTS (SOLUBLE)	S			1		1									
IRON SELENIDE															
IRON SORBITOL															
IRON TALLATE															
ISOAMYL ACETATE	L		142-B	525		1		1065 - TCLO-IHL-HMN-4	U-	0.018-10					
ISOAMYL ALCOHOL	L		132-B	360		1		3970-K-LD50-SKN-RBT-4	U-	0.001-10					
ISOAMYLNITROSONITROGUANIDINE															
ISOBORNYL THIOCYANOACETATE	L							0.2-K-LD50-ORL-RAT-4					0.2		
ISOBUTANE	G		-11.7-B												
ISOBUTYL ACETATE	L	10-12.8	118-B	700		1		30600 - LCLO-IHL-RAT-4	U-	2.38- 7					
ISOBUTYL ALCOHOL	L	10-21.7	107.9-B	300		1		24500 - LCLO-IHL-RAT-4	U-	0.009-10					
ISOBUTYLENE	L	3290-40.5	-6.9-B												
ISOBUTYL NITROSONITROGUANIDINE															
ISOBUTYL METHYLCYCLOHEXYL PHTHALATE															
ISOOCTANE	L	40.6-21	99.2-B												
ISOOCTYL ALCOHOL								1480-K-LD50-ORL-RAT-4					1480	I-	2065
ISOOCTYL EPOXY TALLATE															
ISOOCTYL STEARATE															
ISOPHORONE	L	1-38	215.2-B	28		1		2330-K-LD50-ORL-RAT-4	U-	3.10- 7			2330		
ISOPHTHALIC ACID	S		345-M											I-	890
ISOPRENE	L		34-B					180 - LC50-IHL-RAT-4						I-	1595
ISOPRENYL ALUMINUM															
P-ISOPROPOXY DIPHENYL															
P-ISOPROPOXY DIPHENYLAMINE															
ISOPROPYL ACETATE	L	40-17	88.4-B	950		1		850 - TCLO-IHL-HMN-4	U-	3.76- 7				U-	760
ISOPROPYL ALCOHOL	L	33-20	82.3-B	980		1		192-K-LDLO-ORL-MUS-4	U-	18.4- 7				U-	2975
ISOPROPYL AMINE (SEE MONOISOPROPYLAMINE)	L		31.7-B	12		1		1960 - LCLO-IHL-RAT-4	U-	1.72- 7					
ISOPROPYL AMINE DODECYLBENZENE SULPHONATE															
2-ISOPROPYLANILINE								1180-K-LD50-ORL-RAT-4					1180		
ISOPROPYL ETHER	L	150-25	68.5-B	1050		1		3400 - TDLO-IHL-HMN-4	U-	0.22- 7					
ISOPROPYL GLYCIDYL ETHER				240		1		4200-K-LD50-ORL-RAT-4					4200		
N-ISOPROPYL-N-PHENYL-PARA-PHENYLENEDIAMINE								555-K-LD50-ORL-RAT-4					555		
ISOTHIAZOLE															
ISOTHIAZOLE 4-CARBOXYLIC ACID															
ISOTHIAZOLE 5-CARBOXYLIC ACID															

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5 6 7	TOXIC-TEST-DATA 8 9 10 11 12 13	ODOUR-INFO 14 15 PHY 16 17	O-RAT 18	QUANTITY 19 20
ISOXAZOLE									
JET FUEL	L								
KEROSENE	L		175-B						
KETENE	G		-56-B	0.9	1	40 - LCLO-IHL-MUS-4			
KORAX (SEE CHLORONITROPROPANE)	L		139.5-B			362 - LD50-SKN-RBT-4			
KRYPTON	G		-152-B						
LACTIC ACID	L		122-B			1810-K-LD50-ORL-GPG-4			I- 435
LACTONITRILE	L		103-B			370 - LCLO-IHL-RAT-4			
LANOLIN	S		37.[illegible]-M						U- 95
LARD OIL	L		-[illegible]-M						P- 18844
LATEX									
LAURIC ACID	S	1-121	43-M			131-K-LD50-IVN-MUS-4			I- 170
LAURIC DIETHANOLAMIDE						2700-K-LD50-ORL-RAT-4		2700	
LAURIC ISOPROPANOLAMIDE									
LAURIC MONOETHANOLAMIDE									
LAURYL ALCOHOL	L		25[illegible]-B			800-K-LD50-IPR-RAT-4			
LAURYL ALCOHOL POLETHYLENE GLYCOL									
LAURYL DIMETHYLBENZYLAMMONIUM CHLORIDE									
LAURYL ISOQUINOLINIUM BROMIDE	L					230-K-LD50-ORL-RAT-4		230	
LEAD (FUME,DUST)	S	1-973	327-M	0.15	1				PI-206749
LEAD ACETATE	S		75-M			120-K-LD50-IPR-MUS-4			
LEAD ARSENATE (SEE INSECTICIDES)	S			0.15	1	100-K-LD50-ORL-RAT-4		100	
LEAD AZIDE	S								
LEAD AZOTETRAZOLE									
LEAD CARBONATE	S		315-D	.258	4				U- 490
LEAD CHLORIDE	S	1-547	50[illegible]-B	.269	4	2000-K-LDLO-ORL-GPG-4			
LEAD CHLORITE	S		12[illegible]-E						
LEAD CHROMATE	S		84[illegible]-M	0.10	4	1200-K-LDLO-SCU-RAT-4			
LEAD CYANIDE	S			0.25	4	100-K-LDLO-IPR-RAT-4			
LEAD DINITRORESORCINATE									
LEAD 2-ETHYLHEXOATE									
LEAD FUMARATE									
LEAD ISODECANOATE									
LEAD MONOXIDE	S		88[illegible]-M	.215	4	450-K-LD50-IPR-RAT-4			U- 10325
LEAD NAPHTHENATES									
LEAD NEODECANOATE									
LEAD NITRATE	S		47[illegible]-D	0.32	4	270-K-LDLO-IPR-RAT-4			
LEAD OXIDE BROWN	S	1-943	69[illegible]-M	0.23	4				
LEAD PERCHLORATE	S		10[illegible]-D	0.44	4	275-K-LDLO-IPR-RAT-4			
LEAD PHOSPHITE	S		-D						
LEAD PHTHALATE									
LEAD SILICATE	S		76[illegible]	.273	4				U- 280
LEAD STEARATE	S		11[illegible]						
LEAD STYPHNATE	S		31[illegible]						
LEAD SULPHATE	S		100[illegible]	.293	4	300-K-LD50-IPR-GPG-4			U- 160
LEAD TALLATE									
LEAD TETROXIDE				0.22	4	220-K-LD50-IPR-GPG-4			U- 280
LEAD TRINITROPHLOROGLUCINATE									
LECITHIN									AS- 2797
LIGNOSULPHONATES									
LINOLEIC ACID	L		23[illegible]-B						
LINSEED OIL	L		20[illegible]-B						UE- 23291
LIQUIFIED PETROLEUM GAS				1800	1				
LITHIUM	S	1-723	17[illegible]						

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	ODOUR-INFO 14	15	16	PHY 17	O-RAT 18	QUANTITY 19	20
LITHIUM ALUMINUM HYDRIDE	S														
LITHIUM CHLORIDE	S	1-547	617-M					757-K-LD50-ORL-RAT-4					757		
LITHIUM HYDRIDE	S		680-M	0.05		1		22 - LCLO-IHL-RAT-4							
LITHIUM NAPTHENATE															
LITHIUM NITRATE	S		255-M												
LITHIUM STEARATE															
LITHOCHOLIC ACID								3900-K-LD50-ORL-MUS-4							
LITHOL RED														U-	0.2
LITHOPHONES, CADMIUM														U-	140
D-LYSERGIC ACID															
MAGNESIUM	S	1-621	651-M					230-K-LDLO-ORL-DOG-4						PI-	11876
MAGNESIUM ACETATE								3730-K-LD50-IVN-MUS-4							
MAGNESIUM ARSENATE	S							280-K-LDLO-ORL-RAT-4							
MAGNESIUM CARBONATE	S		350-D												
MAGNESIUM CHLORATE	S		35[illegible]-M					1000-K-LDLO-ORL-MUS-4							
MAGNESIUM CHLORIDE	S		706-M												
MAGNESIUM DESOXYCHOLATE															
MAGNESIUM HYDROXIDE	S		350-D												
MAGNESIUM LAURYL SULPHATE															
MAGNESIUM LIGNOSULPHONATES															
MAGNESIUM NAPTHENATE															
MAGNESIUM NITRATE	S		125-M												
MAGNESIUM OXIDE (FUME)	S		2500-M	10		1		400 - TCLO-IHL-HMN-4						U-	2685
MAGNESIUM SALICYLATE															
MAGNESIUM SILICATE	S														
MAGNESIUM STEARATE	S		88.5-M												
MAGNESIUM SULPHATE	S		200-M					1750-K-LDLO-SCU-RBT-4						U-	855
MAGNESIUM XYLENE SULPHONATE															
MALACHITE GREEN	S		-M					75-K-LDLO-ORL-RBT-4							
MALEIC ACID	S		130.5-M					708-K-LD50-ORL-RAT-4					708		
MALEIC ANHYDRIDE	S	1-44	5[illegible]-M	1		1		850-K-LDLO-ORL-RAT-4	U-	1.0	-13			U-	1665
MALEIC HYDRAZIDE	S		30[illegible]-M					3860-K-LD50-ORL-RAT-4					3800		
MALONIC ACID	S		13[illegible]-M					1310-K-LD50-ORL-RAT-4					1310		
MANGANESE AND COMPOUNDS	S	1-1292	126[illegible]-M	5		1		11 - TCLO-IHL-HMN-4						I-	2545
MANGANESE ARSENATE	S														
MANGANESE CARBONATE	S														
MANGANESE CHLORIDE	S		650-M					210-K-LDLO-SCU-MUS-4							
MANGANESE CYCLOPENTADIENYLTRICABONYL				0.1		1									
MANGANESE DIOXIDE	S		535-M					45-K-LDLO-IVN-RBT-4						U-	4400
MANGANESE DISODIUM VERSENATE															
MANGANESE 2-ETHYLHEXOATE															
MANGANESE ISODECANOATE															
MANGANESE LINOLEATE															
MANGANESE NAPTHENATES															
MANGANESE NEODECANOATE															
MANGANESE NITRATE	S		25.6-M												
MANGANESE SULPHATE	S		700-M					120-K-LD50-IPR-MUS-4							
MANGANESE TALLATE															
MELAMINE	S	50-315	250-M					1600-K-LDLO-ORL-MUS-4						U-	375
MELAMINE FORMALDEHYDE RESINS														I-	755
MENTHOL	S	1-56	42.5-M					3180-K-LD50-ORL-RAT-4					3180	I-	45
MEPROBAMATE															
MEPRYLCAINE HYDROCHLORIDE															
2-MERCAPTOBENZOTHIAZOLE	S		170-M												

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5 6 7	TOXIC-TEST-DATA 8 9 10 11 12 13	OCCUR-INFO 14 15 16 17	PHY 18	C-RAT 19	QUANTITY 20
MERCURIC ACETATE	S		-D			62-K-LD50-ORL-MUS-4				
MERCURIC CHLORIDE	S	1-136	277-M			10-K-LD50-ORL-MUS-4				
MERCURIC CYANIDE	S		-D			25-K-LDLO-ORL-RAT-4				
MERCURIC DIAMMONIUM CHLORIDE										
MERCURIC IODINE	S		259-M			357-K-LDLO-ORL-HMN-4				
MERCURIC NITRATE	S		75-M			8-K-LD50-IPR-MUS-4				
MERCURIC SULPHATE	S		-D			40-K-LD50-ORL-MUS-4				
MERCUROUS NITRATE	S		70-M			297-K-LD50-ORL-RAT-4		297		
MERCURY ALKYL COMPOUNDS	L	1-126	357-B	0.01	1					
MERCURY AND COMPOUNDS				0.05	1	0.169 - TCLO-IHL-HMN-4				
MESITYL OXIDE	L	10-26	130-B	100	1	4079 - LCLO-IHL-RAT-4	U- 0.20- 7			
METHACRYLIC ACID	S		15-B			49-K-LD50-IPR-MUS-4			U-	50
METHACRYLONITRILE	L	40-12.8	90-B	3	1	250-K-LD50-ORL-RAT-4		230		
METHANOL (SEE METHYL ALCOHOL)	L	100-21.1	64.3-B	260	1	400 - TCLO-IHL-HMN-4	U- 70.00- 7		U-	51071
METHANOL AMINE	S		280-M							
METHAQUALONE						137-K-LD50-ORL-RAT-4		137	U-	51071
METHAQUALONE HYDROCHLORIDE						2-K-TDLO-ORL-HMN-4				
METHENAMINE						512-K-LDLO-IPR-MUS-4				
METHIONINE	S								I-	1320
METHOXYCARBONYLHYDRAZINE										
2-METHOXY-5-CHLORO-3-NITROSALICYLANILIDE										
2-METHOXYETHANOL	L	6.2-20	124.5-B	80	1	2460-K-LDKO-ORL-RAT-4		2460		
2-METHOXYETHYL ACETATE				120	1	3930-K-LD50-ORL-RAT-4		3930		
4-METHOXY-4-METHYL PENTANONE										
M-METHOXY-THIOPHENOL										
METHYL ACETATE	L	100-9.4	57.8-B	610	1	4800-K-LD50-ORL-RAT-4	U-605.00- 8	4800		
METHYL ACETYLENE	G	5A-20	-105-B	1650	1					
METHYL ACRYLATE	L	100-28	80-B	35	1	300-K-LD50-ORL-RAT-4		300	U-	2
METHYLAL (ALSO DIMETHOXYMETHANE)	L	330-20	42.3-B	3100	1	3013-K-LDLO-SCU-GPG-4				
METHYL ALCOHOL (SEE METHANOL)	L	100-21.1	64.6-B	260	1	400 - TCLO-IHL-HMN-4	U- 70.00- 7		U-	51071
METHYL ALUMINUM SESQUICHLORIDE	L		143.7-B							
METHYL AMINE (SEE MONOMETHYLAMIN)	G		-6.4-B	12	1	2500-K-LDLO-SCU-MUS-4	R- 0.03- 6			
METHYL AMINE HCL						800 - LDLO-SKN-RBT-4				
P-METHYLAMINO-PHENOL	S		87-M							
METHYL AMMONIUM METHYLDITHIOCARBAMATE										
METHYL AMYL ACETATE	L	3.8-20	146.3-B			12000 - LCLO-IHL-RAT-4	U- 1.35- 7		U-	185
METHYL AMYL ALCOHOL	L	2.8-20	131.9-B	100	1	2600-K-LD50-ORL-RAT-4	U- 2.17- 7	2600		
METHYL N-AMYL KETONE	L	2.6-20	151.6-B	465	1	1670-K-LD50-ORL-RAT-4		1670		
METHYL BROMIDE (SEE FUNGICIDES)	L		3.6-B	60	1	700-K-LD50-ORL-RAT-4		700		
METHYL CHLORIDE	G		-23.7-B	210	1	1800-K-LD50-ORL-RAT-4	R- 20.60- 6	1800	U-	3215
METHYL CHLOROFORM	L	100-20	74.1-B	1900	1	1940 - TCLO-IHL-HMN-4				
2-METHYL-3-CHLORO-3-NITROSALICYLANILIDE										
2-METHYL-4-CHLORO-3-NITROSALICYLANILIDE										
2-METHYL-5-CHLORO-3-NITROSALICYLANILIDE										
2-METHYL-4-CHLOROPHENOXYACETIC ACID						700-K-LD50-ORL-RAT-4		700		
METHYL 2-CYANOACRYLATE				8	1	100-K-LDLO-IPR-RAT-4				
METHYL CYCLOHEXANE	L	40-22	100-B	2000	1	4000-K-LDLO-ORL-RBT-4				
METHYLCYCLOHEXANOL	L		155-B	235	1	1750-K-LDLO-ORL-RBT-4				
METHYL CYCLOHEXANONE	L		165-B	230	1	1000-K-LDLO-ORL-RBT-4				
METHYL CYCLOPENTADIENYL MANGANESE TRICARBONYL				0.2	1	23-K-LDLO-ORL-RAT-4		23		
METHYL DEMETON				0.5	1	40-K-LD50-ORL-RAT-4		40		
METHYL DODECYL BENZYL AMMONIUM CHLORIDE						385-K-LD50-ORL-RAT-4		389		
METHYLENE BIPHENYL ISOCYANATE				0.2	1					
METHYLENE BLUE										

COMPOUND NAME	PHYSICAL-PROPERTIES			TLV-TWA-CAR				TOXIC-TEST-DATA	ODOUR-INFO	PHY	O-RAT	QUANTITY	
	1	2	3	4	5	6	7	8 9 10 11 12 13	14 15 16	17	18	19	20
METHYLENE CHLORIDE (SEE DICHLOROMETHANE)	L	380-22	40.1-B	890		1		10500 - TCLO-IHL-HMN-4	U-520.00- 8			U-	915
METHYLENE IODIDE													
METHYL ETHYL KETONE (SEE 2-BUTANONE)													
METHYL FORMAMIDE													
METHYL FORMATE													
METHYL-D-GLYCERATEL													
3-METHYL HEPTANE (ALSO ISOOCTANE)													
6-METHYL-2,4-HEPTANEDIONE													
METHYL IODIDE													
METHYL ISOAMYL KETONE	L		144-B	460		1		4760-K-LD50-ORL-RAT-4	U- 1.15- 7		4760		
METHYL ISOBUTYL CARBINOL													
METHYL ISOBUTYL KETONE													
METHYL ISOCYANATE	L		59.6-B	0.05		1		71-K-LD50-ORL-RAT-4			71		
METHYL LAURATE													
METHYL MERCAPTAN													
METHYL MERCURY CHLORIDE													
METHYL MERCURY DICYANDIAMIDE													
METHYL METHACRYLATE													
METHYL NAPHTHOQUINONE													
METHYL NITROSONITROGUANIDINE													
N-METHYL-NITROSO-P-TOLUENESULPHONAMIDE	S												
METHYL OXALATE													
METHYL PARATHION (SEE INSECTICIDES)	S		120-E	0.2		1		67-K-LD50-SKU-RAT-4					
METHYL SALICYLATE	L	1-54	222-B					170-K-LDLO-ORL-HMN-4	O-100.00-10				
5-METHYL-O-SALICYLANISIDIDE													
METHYL SILICATE	L			30		1		250-K-LD50-IPR-MUS-4					
METHYL STYRENE	L	1-7.4	165.4-B	480		1		2500 - LCLO-IHL-MUS-4	U- 0.754- 7			U-	150
TALLOW AMINE													
METHYL TALLOWATE													
METHYL TETRAMETHYLENE SULPHONIUMBROMIDE													
METHYL P-TOLUENESULPHONATE	S		157-B					1000-K-LDLO-ORL-RAT-4					
METHYL VINYL KETONE	L		80-B					16-K-LDLO-IPR-MUS-4					
METHYL VIOLET													
MICA	S			20	*	1							
MOLYBDATE ORANGE	S											U-	545
MOLYBDENUM SOLUBLE CMPDS	S			5		1						P-	17677
MOLYBDENUM INSOLUBLE CMPDS	S			10		1							
MOLYBDENUM TRIOXIDE	S		795-M	7.5		4		6 - TCLO-IHL-HMN-4				I-	35
MOLYBDIC ANHYDRIDE	S		795-M										
MONOACETONE GLUCOSE													
MONOAMYLAMINE	L		52-B										
MONO-N-BUTYLAMINE	L		10-F	15		4		12150 - LCLO-IHL-RAT-4					
MONO-S-BUTYLAMINE	L		63-B										
MONOCHLOROACETIC ACID	S		189-B					76-K-LD50-ORL-RAT-4			76	I-	20
MONOCHLORODIFLUOROMETHANE	G		-40.8-B										
MONOETHANOLAMINE	L	6-60	170.5-B					2100-K-LD50-ORL-RAT-4			2100	U-	1255
MONOETHYLETHANOLAMINE													
MONOETHANOLAMINE LAURYL ETHER SULPHATE													
MONOETHANOLAMINE LAURYL SULPHATE													
MONOGLYCERIDE													
MONOISOBUTYLAMINE	L	100-18.8	65-B										
MONOISOPROPYLAMINE (SEE ISOPROPYLAMINE)	L		32.4-B	12		1							
MONOMETHYLAMINE (SEE METHYLAMINE)	G		-6.5-B	12		1		2500-K-LDLO-SCU-MUS-4	R- 0.09- 6				
MONOMETHYLANILINE	L	1-36	190-B	9		1		280-K-LDLO-ORL-RBT-4					

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	ODOUR-INFO 14	15	16	PHY 17	O-RAT 18	QUANTITY 19	20
MONOMETHYLHYDRAZINE				0.35		1		32-K-LD50-ORL-RAT-4					32		
MONO-N-PROPYLAMINE (SEE N-PROPYLAMINE)	L		48.7-B												
MORPHOLINE	L	10-23	129-B	70		1		500-K-LD50-SKN-RBT-4	U-	0.25-	7			I-	305
MYRISTIC ACID	S	20-204	326-B					43-K-LD50-IVN-MUS-4							
MYRISTYLDIMETHYLBENZYLAMMONIUM CHLORIDE	S														
NAPHTHA COAL TAR	L		160-B	400		1		60000 - LDLO-IHL-RAT-4							
B-NAPHTHALAMINE	S		306-B												
NAPHTHALENE	S	1-52.6	218-B	50		1		1780-K-LD50-ORL-RAT-4	U-	131.00-	10		1780	U-	1675
B-NAPHTHAQUINOLINE															
NAPHTHENIC ACID	S		3[illegible]-M					3000-K-LD50-ORL-RAT-4					3000	I-	1175
A-NAPHTHOL	S	1-94	96-M					880-K-LD50-SKN-RBT-4						U-	170
B-NAPHTHOL	S	10-145	123-M					2420-K-LD50-ORL-RAT-4					2420		
1,4-NAPHTHOQUINONE	S		12[illegible]-M					20-K-TDLO-SKN-MUS-4							
NAPHTHYLAMINE	S	1-104	50-M	CAR		1	C	779-K-LD50-ORL-RAT-4					779		
NEATSFOOT OIL	L		2[illegible]-M											AS-	140
NEPHELINE SYENITE														P-491000	
NICKEL (DUST,FUME,SOLUBLE SALTS)	S	1-1910	1452-M	1		1		15- TDLO-IHL-GPG-4						P-308042	
NICKEL A[illegible]IDE															
NICKEL AMMONIUM SULPHATE	S														
NICKEL ARSENIDE	S		96[illegible]-M												
NICKEL CARBONATE	S		-D												
NICKEL CARBONYL	L	400-25.8	4[illegible]-B	.007		1		400 - LCLO-IHL-HMN-4							
NICKEL CHLORIDE	S	1-671	987-B	2.2		4		10-K-LDLO-IVN-DOG-4							
NICKEL CYANIDE	S														
NICKEL 2-ETHYLHEXOATE															
NICKEL FERRITE															
NICKEL NITRATE	S		56.7-M	4.9		4		1620-K-LDKO-ORL-RAT-4					1620		
NICKELOUS ACETATE				3		4		350-K-LD50-ORL-RAT-4					350		
NICKELOUS CHLORIDE (SEE NICKEL CHLORIDE)	S	1-671	987-B	2.2		4		10-K-LDLO-IVN-DOG-4							
NICKEL OXIDE	S		1990-M	1.3		4		20-K-LDLO-ITS-RAT-4							
NICKEL SELENIDE	S		84[illegible]-M	2.2		4									
NICKEL SULPHATE	S							21-K-LD50-IPR-MUS-4							
NICLOSAMIDE								750-K-LD50-IPR-RAT-4							
NIFURALDEZONE															
NIHYDRAZONE															
NITRAZEPAM								0.07-K-TDLO-ORL-HMN-4							
NITRIC ACID	L		86-B	5		1		125 - LC50-IHL-RAT-4						U-	54160
NITRIC OXIDE	G		-152-B	30		1		387 - LC50-IHL-RBT-4							
NITRILOTRIACETIC ACID	S							1470-K-LD50-ORL-RAT-4					1470		
3-NITRO-4-ACETOXYBENZOIC ACID															
M-NITROANILINE	S	1-119	11[illegible]-M					308-K-LD50-ORL-MUS-4							
O-NITROANILINE	S	1-104	71-M					535-K-LD50-ORL-RAT-4					535		
P-NITROANILINE	S	1-142	146.5-M					3249-K-LD50-ORL-RAT-4					3249		
3-NITROBENZANILIDE				6		1									
NITROBENZENE	S	1-44	[illegible]-M	5		1		600-K-LDLO-SKN-RBT-4	R-	0.02-	6				
O-NITROCHLOROBENZENE	S		4[illegible]-M												
P-NITROCHLOROBENZENE	S		83-M	1		1		420-K-LD50-ORL-RAT-4					420		
3-NITROCYLANILIDE															
4-NITRODIPHENYL				CAR		1	C	5[illegible]00-K-TDLO-ORL-DOG-4							
NITROETHANE	L	15.6-20	11[illegible]-M	310		1		500-K-LDLO-ORL-RBT-4							
NITROFURAZONE	S							590-K-LDLO-ORL-RAT-4					590		
NITROGEN	G		-19[illegible]-B											AS-	99255
NITROGEN DIOXIDE (ALSO NITROGEN TETROXIDE)	G	400-80	21-D	9		1		12[illegible] - TCLO-IHL-HMN-4	U-	7.50-	8				
NITROGEN OXIDE	G											P			

COMPOUND NAME	1	2	3	4	5	6	7	8 9 10 11 12 13	14	15	16	17	18	19	20
	PHYSICAL-PROPERTIES			TLV-TWA-CAR				TOXIC-TEST-DATA	ODOUR-INFO		PHY		O-RAT		QUANTITY
NITROGEN TRIFLUORIDE	G		-129-B	29											
NITROGLYCERIN	L	1-127	250-E	1.9		1		80-K-LOLO-ORL-RAT-4							
NITROGUANIDINE	S		246-B												
NITROHYDROCHLORIC	L														
NITROMETHANE	L	27.8-20	101-B	250		1		2446 - LCLO-IHL-MKY-4							
3-NITRO-4-METHOXYBENZOIC ACID															
NITROPARAFFIN	L		103-F												
O-NITROPHENOL	S	1-49.3	45-M					1297-K-LD50-ORL-RAT-4					1297		
P-NITROPHENOL	S		113-M					350-K-LD50-ORL-RAT-4					350		
P-NITROPHENYL-HYDRAZINE								250-K-LDLO-IPR-MUS-4							
P-NITROPHENYL-HYDRAZINE HYDROCHLORIDE															
P-NITROPHENYL-A-D-MANNOPYRANOSIDE															
NITROPHENYLPHOSPHORODICHLORIDATE															
P-NITROPHENYLTHYMIDINE-3-PHOSPHATE															
P-NITROPHENYLTHYMIDINE-5-PHOSPHATE															
1-NITROPROPANE	L	7.5-20	132-B	90		1		250-K-LDLO-ORL-RBT-4							
2-NITROPROPANE	L	10-15.8	120-B	90		1		55 - TDLO-IHL-HMN-4							
2-NITRO-P-SALICYLANILIDE															
4-NITRO-O-SALICYLANISIDIDE															
3-NITRO-2,3-SALICYLOXYLIDIDE															
3-NITRO-2,4-SALICYLOXYLIDIDE															
3-NITRO-2,5-SALICYLOXYLIDIDE															
3-NITRO-2,6-SALICYLOXYLIDIDE															
N-NITROSODIPHENYLAMINE	S		87.8-M	CAR		1	C								
M-NITROTOLUENE	L	1-50.2	232-B	30		1		330-K-LDLO-ORL-MUS-4							
O-NITROTOLUENE	L	1-50	220-B	30		1		891-K-LD50-ORL-RAT-4					891		
P-NITROTOLUENE	L	1-53.7	238-B	30		1		1231-K-LD50-ORL-MUS-4							
NITROTRICHLOROMETHANE (ALSO CHLOROPICRIN)	L	40-34	112-B	0.7		1		27 - TCLO-IHL-HMN-4							
NITROUS OXIDE	G		-88.5-B												
NONENE	L		150-B												
NONYL PHENOL	L		290-B					1620-K-LD50-ORL-RAT-4					1262		
NONYL PHENOL ETHOXYLATE															
NONYL PHENOL POLYETHYLENE GLYCOL ETHER SULFATE															
NUCLEIC ACID															
NYLON 6	S														
NYLON 66	S														
OCTACHLORONAPHTHALENE				0.1		1									
OCTADECYLAMIDE															
OCTANE	L	10-19.2	126-B	1900		1			U-	700-11					
N-OCTYL-N-DECYL ADIPATE	L		220-B												
N-OCTYL-N-DECYL PHTHALATE	L		232-B												
P-OCTYL DIPHENYLAMINE															
OCTYLNITROSONITROGUANIDINE															
OCTYL PHENOLS	S		280-B					25-K-LDLO-IPR-MUS-4							
OIL-CRUDE	L														
OIL-CUTTING (MIST)	L			5		1									
OIL-FUEL-LIGHT	L														
OLEIC ACID	L	1-176.5	286-B					50-K-LDLO-IVN-CAT-4						U-	2045
OLEIC DIETHANOLAMIDE															
OLEIC MONOETHANOLAMIDE															
OLEYL ALCOHOL	L		333-B												
OLEYL AMIDE															
OLEYL HYDROXYMETHYL IMIDAZOLINE															
OLIVE OIL	L		225-F											I-	2344

CONTROL DATA CORPORATION PRINTED IN U.S.A.

COMPOUND NAME	PHYSICAL-PROPERTIES			TLV-TWA-CAR				TOXIC-TEST-DATA	ODOUR-INFO			PHY	O-RAT	QUANTITY	
	1	2	3	4	5	6	7	8 9 10 11 12 13	14	15	16	17	18	19	20
OSMIUM TETROXIDE	S		2700-M	.002		1		0.1 - TCLO-IHL-HMN-4							
OXALIC ACID	S		101-M	1		1		700-K-LDLO-ORL-HMN-4							
OXYDIPROPIONITRILE	L		155-B					2830-K-LD50-ORL-RAT-4					2830	I-	435
OXYGEN	G		-183-B											AS-432589	
OXYGEN DIFLUORIDE	G		-145-B	0.1		1		6.6 - LC50-IHL-RAT-4							
OZONE	G		-112-B	0.2		1		2 - TCLO-IHL-HMN-4	U-	0.01-	8	P			
PALLADIUM AMINE NITRATE															
PALLADIUM BLACK															
PALLADIUM CHLORIDE	S		501-M					19-K-LDLO-IVN-RBT-4							
PALMITIC ACID	S		352-B					57-K-LD50-IVN-MUS-4							
PALMITIC DIETHANOLAMIDE															
PALMITIC MONOETHANOLAMIDE															
PALMITYL BENZYL AMMONIUM CHLORIDE															
PALM OILS	S		27-[illegible]											PI-	26764
PAN								525 - LC50-IHL-MUS-5				P			
PARAFFIN WAX (FUMES)	S		50-M	2		1		600-K-TDLO-IMP-MUS-4							
PARAFORMALDEHYDE	S	1.45-25	120-M											U-	125
PARATHION (SEE INSECTICIDES)	L		375-M	0.1		1		2-K-LD50-ORL-RAT-4					2		
PEANUT OIL	L		282-F											PI-	17086
PENDIMETRAZINE BITARTRATE															
PENDIMETRAZINE HYDROCHLORIDE															
PENTABORANE (STABLE)	G	66-0	0.0-B	0.01		1		9 - LC50-IHL-MUS-4							
PENTACHLOROETHANE	L		159-B					35600 - LCLO-IHL-RAT-4							
PERCHLOROMETHYL MERCAPTAN	L		145-B	0.8		1		83-K-LD50-ORL-RAT-4					83		
PENTACHLORONAPHTHALENE	S			0.5		1									
PENTACHLOROPHENOL	S	40-211	191-M	0.5		1		29-K-LDLO-ORL-HMN-4							
PENTAERYTHRITOL	S		276-B	10		1								U-	3800
PENTAERYTHRITOL TETRANITRATE	S		135-[illegible]												
N-PENTANE	L	400-18.5	36-B	1475		1		390000- TCLO-IHL-HMN-4							
PENTASODIUM DIETHYLENETRIAMINEPENTAACETATE	S														
PENTASODIUM TRIPHOSPHATE	S							525-K-LD50-IPR-RAT-4							
PEPTONE OF CASEIN	S														
PERCHLORIC ACID	L		19-B												
PERCHLOROETHYLENE	L	15.8-22	121-B	670		1		1585 - TCLO-IHL-HMN-4	U-	31.90-11					
PERCHLORYL FLUORIDE	G		-47-B	14		1		1640 - LC50-IHL-RAT-4							
PERLITE	S			30	*	1									
PEROXYACETYL NITRATE (SEE PAN)												P			
PHENANTHRAQUINONE	S							20-K-LDLO-SKN-MUS-4							
P-PHENANTHROLINE	S														
PHENAZINE-1-CARBOXYLIC ACID															
O-PHENETIDINE	L	1-67	230-B											I-	130
P-PHENETIDINE	L		253-B												
PHENOL	S	1-40	40.5-M	19		1		14-K-LDLO-ORL-HMN-4	U-	0.18-14				U-	29595
PHENOL FORMALDEHYDE RESINS	S													AS-	44260
PHENOTHIAZINE (ALSO THIODIPHENYLAMINE)	S		177-M	5		1		5000-K-LD50-ORL-RAT-4					500		
4-PHENYLAZO-3-NITROSALICYLANILIDE															
PHENYLAZOPYRIDINE HYDROCHLORIDE															
P-PHENYLENE DIAMINE	S		140-M	0.1		1		100-K-LDLO-ORL-RAT-4							
O-PHENYLENEPHOSPHOROCHLORIDATE															
O-PHENYLENEPHOSPHOROCHLORIDITE															
PHENYL ETHER				7		1		4000-K-LDLO-ORL-RAT-4							
PHENYL GLYCIDYL ETHER	L		245-B	62		1		3850-K-LD50-ORL-RAT-4					3850		
PHENYLHYDRAZINE	S	1-71.9	19.6-M	22		1		165-K-LD50-ORL-RAT-4					156		
PHENYLMAGNESIUM CHLORIDE	S														

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	ODOUR-INFO 14	15	16	PHY 17	O-RAT 18	QUANTITY 19	20
PHENYLMERCURIC ACETATE	S		149-M					40-K-LD50-ORL-RAT-4					40	U-	20
PHENYLMERCURIC HYDROXIDE	S		197-M												
PHENYLMERCURIC NITRATE	S		176-M					63-K-LD50-SCU-RAT-4							
PHENYLMERCURIC OLEATE	S													U-	15
N-PHENYL NAPHTHYLAMINE	S		108-M					1450-K-LD50-ORL-MUS-4							
PHENYLPHOSPHINE	L		160-B	0.25		1		171 - LC50-IHL-RAT-4							
PHENYL SULFONIC ACID	L							890-K-LD50-ORL-RAT-4					890		
PHENYL THIOUREA	S		154-M					3-K-LD50-ORL-RAT-4					3		
PHLOROGLUCINOL	S	10-168	133-M					1550-K-LDL0-SCU-RAT-4							
PHOSPHINE	G		87.5-B	0.4		1		11.1 - LCL0-IHL-HMN-4	U-	0.029-	9				
O-PHOSPHORIC ACID	S	.028-20	42.4-M	1		1		100 - TCL0-IHL-HMN-4						AS-	13508
PHOSPHORIC ANHYDRIDE	S	1-384	563-M												
PHOSPHORUS (WHITE)	S	1-76.6	44-M	0.1		1		1.4-K-LDL0-ORL-HMN-4						U-	25
PHOSPHORUS OXYCHLORIDE	L	40-27.3	107-B												
PHOSPHORUS PENTACHLORIDE	S	1-15.5	166.7-M	1		1		1040 - LCL0-IHL-MUS-4							
PHOSPHORUS PENTASULPHIDE	S		276-B	1		1		389-K-LD50-ORL-RAT-4					389		
PHOSPHORUS TRICHLORIDE	L	100-21	76-B	3		1		3425 - LCL0-IHL-MUS-4							
PHTHALIC ACID	S		206-M					4600-K-LDL0-ORL-RAT-4							
PHTHALIC ANHYDRIDE	S	1-96.5	131-M	12		1		100-K-LDL0-ORL-GPG-4						U-	18390
PICRIC ACID	S		122-M	0.1		1		200-K-LDL0-SCU-FRG-4	R-	.00048-	6				
PIPERAZINE	S		104-M												
PIVAL	S			0.1		1		150-K-LDL0-ORL-RAT-4							
PLATINUM (SOLUBLE SALTS)	S		1773-M	.002		1									
PLATINUM CHLORIDE	S							23-K-LDL0-IVN-RBT-4							
PLATINUM DIOXIDE	S														
PLATINUM GAUZE CATALYST	S														
PLATINUM MONOXIDE	S														
POLYAMIDE RESINS														I-	5870
POLYBUTADIENE															
POLYCHLORINATED BIPHENYLS	L														
POLYESTER RESINS														I-	9545
POLYETHYLENE GLYCOL	L		190-F					420000K-TDL0-IVG-MUS-4							
POLYETHYLENE GLYCOL MONOBUTYL ETHER															
POLYETHYLENE RESINS														PI-	227356
POLYFLAVANOIDS															
POLYISOBUTYLENE RESINS															
TRANS-POLYISOPRENE															
POLYMETHACRYLATE COPOLYMERS															
POLYPROPYLENE GLYCOL	L		305-F					419-K-LDL0-ORL-RAT-4					419		
POLYPROPYLENE GLYCOL ESTERS															
POLYSTYRENE ACRYLIC COPOLYMERS															
POLYSTYRENE POLYMER								19-K-LDL0-SCU-RAT-4							
POLYURETHANE FOAM								325-K-LDL0-IMP-RAT-4						I-	4325
POLYVINYL ACETATE	S													U-	3495
POLYVINYL ALCOHOL	S		200-D												
POLYVINYL CHLORIDE	S							100-K-TDL0-SCU-RAT-4							
PORTLAND CEMENT	S			30	*	1									
POTASSIUM ACETATE	S		292-M					3250-K-LD50-ORL-RAT-4					3250		
POTASSIUM ACID CITRATE															
POTASSIUM ALGINATE	S														
POTASSIUM AMYL XANTHATE															
POTASSIUM ARSENITE	S			0.05		4		665-K-TDL0-ORL-HMN-4							
POTASSIUM AZIDE	S		350-M												
POTASSIUM BINOXALATE	S		-D												

COMPOUND NAME	PHYSICAL-PROPERTIES			TLV-TWA-CAR				TOXIC-TEST-DATA						ODOUR-INFO		PHY		O-RAT	QUANTITY	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
POTASSIUM BIPHTHALATE																				
POTASSIUM BITARTRATE	S																		U-	180
POTASSIUM BROMATE	S		434-M																	
POTASSIUM-T-BUTOXIDE																				
POTASSIUM-N-BUTYL XANTHATE																				
POTASSIUM CASEINATE																				
POTASSIUM CHLORATE	S		366-M					1500-K-LDLO-ORL-RAT-4											U-	515
POTASSIUM CHLORIDE	S		790-M					2430-K-LDLO-ORL-RAT-4												UE5717205
POTASSIUM CHLOROPLATINATE	S		250-D																	
POTASSIUM CHROMATE	S		971-M	0.1		4		430-K-LDLO-ORL-HMN-4												
POTASSIUM CITRATE	S		-D																	
POTASSIUM CUPROCYANIDE	S																			
POTASSIUM CYANIDE	S		635-M	5		4		10-K-LD50-ORL-RAT-4										10		
POTASSIUM DICHROMATE	S		39?-M																	
POTASSIUM DINITROCRESORCINATE																				
POTASSIUM DODECYL BENZENE SULPHONATE																				
POTASSIUM ETHYL XANTHATE	S		200-M					400-K-LDLO-SCU-MUS-4												
POTASSIUM FERRICYANIDE	S		-D					1600-K-LDLO-ORL-RAT-4												
POTASSIUM FLUORIDE (ANHYDROUS)	S	1-885	880-M	7.6		4		245-K-LD50-ORL-RAT-4										245		
POTASSIUM HYDROXIDE	S	1-719	360-M	2		1		365-K-LDKO-ORL-RAT-4										365	U-	4720
POTASSIUM IODATE	S		560-M																	
POTASSIUM IODIDE	S	1-745	722-B					120-K-LDLO-IVN-RAT-4											U-	10
POTASSIUM ISOPROPYL XANTHATE																				
POTASSIUM LAURYL ETHER SULPHATE																				
POTASSIUM LAURYL SULPHATE																				
POTASSIUM LIGNOSULPHONATES																				
POTASSIUM LINOLEATE	S																			
POTASSIUM NAPTHENATE	S																			
POTASSIUM NITRATE	S		334-M																	
POTASSIUM OLEATE	S																			
POTASSIUM OSMATE	S		100-4																	
POTASSIUM OXALATE	S		-D																	
POTASSIUM PALLADIUM CHLORIDE	S																			
POTASSIUM PERMANGANATE	S		240-D					1090-K-LD50-ORL-RAT-4										1090		
POTASSIUM PEROXIDE	S		490-M																	
POTASSIUM PHOSPHATES	S																		I-	1900
POTASSIUM N-PROPYL XANTHATE																				
POTASSIUM SILICATE (TETRA)	S																		I-	1030
POTASSIUM SILVER CYANIDE								21-K-LD50-ORL-RAT-4										21		
POTASSIUM STANNATE	S																			
POTASSIUM SULPHATE	S		1072-M					3000-K-LDLO-SCU-GPG-4											I-	20450
POTASSIUM SULPHIDE	S																			
POTASSIUM TARTRATE	S																			
POTASSIUM TELLURITE	S		460-M					35-K-LDLO-IVN-DOG-4												
POTASSIUM TETRABORATE	S		-D																	
POTASSIUM THIOCYANATE	S		17?-M					80-K-LDLO-ORL-HMN-4												
POTASSIUM TITANIUM FLUORIDE	S																			
POTASSIUM TOLUENE SULPHONATE																				
POTASSIUM XYLENE SULPHONATE																				
PROCHLORPERAZINE DIMALEATE								400-K-LD50-ORL-MUS-4												
PROLACTIN	S																			
PROMAZINE HYDROCHLORIDE	S																			
1-PROPANE	G		-42.?-B	1800		1								U- 35050-10						P-452700
PROPARGYL ALCOHOL	L	11.6-20	11-B	2		1		0.07-K-LDLO-ORL-RAT-4										0.07		

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	ODOUR-INFO 14	15 16	PHY 17	O-RAT 18	QUANTITY 19	20
B-PROPIOLACTONE	L		155-D	CAR		1	C	50-K-LDLO-ORL-RAT-4						
PROPIONALDEHYDE	L		48.0-B					19300 - LCLO-IHL-RAT-4	U-	0.09- 7				
PROPIONHYDROXAMIC ACID														
PROPIONIC ACID	L	10-40	141-B					500-K-LD50-SKN-RBT-4	U-	0.05-10				
N-PROPYL ACETATE	L	40-29	101.6-B	840		1		34000 - LCLO-IHL-RAT-4	U-	0.63- 7			U-	330
N-PROPYL ALCOHOL	L	10-14.7	97.2-B	490		1		10000 - LCLO-IHL-RAT-4	U-	0.20- 7			U-	1440
N-PROPYL AMINE (SEE MONO-N-PROPYLAMINE)	L	248-20	4[illegible]-B					5680 - LC50-IHL-RAT-4						
N-PROPYL-N,N-DI-N-PROPYL THIOCARBAMATE								1630-K-LD50-ORL-RAT-4				1630		
PROPYLENE	G	10A-20	-47.7-B						U-116.30- 7					
PROPYLENE DICHLORIDE	L	40-19.4	96.[illegible]-B	350		1		9400 - LCLO-IHL-RAT-4	U-	2.31- 7				
PROPYLENE GLYCOL	L	0.08-20	187-B										U-	7350
PROPYLENE GLYCOL ALGINATE	S		155-B											
PROPYLENE GLYCOL MONOBUTYL ETHER														
PROPYLENE GLYCOL MONOMETHYL ETHER	L		120-B	360		1		26240 - LCLO-IHL-RAT-4						
PROPYLENE GLYCOL MONOSTEARATE								200-K-LDLO-IPR-MUS-4						
PROPYLENE IMINE	L		66-B	5		1		19-K-LD50-ORL-RAT-4				19		
PROPYLENE OXIDE	L	400-17.8	34-B	240		1		4200 - LC50-IHL-MUS-4	U-	83.20- 7				
PROPYLENE PHENOXETOL														
N-PROPYL NITRATE	L		11[illegible]-B	110		1		100-K-LCLO-IVN-DOG-4						
PROPYLNITROSONITROGUANIDINE														
PROVIDONE-IODINE														
PYRETHRUM (EXTRACT)				5		1		1500-K-LDLO-ORL-RAT-4						
PYRIDINE	L	10-13.2	115.5-B	15		1		1315 - LC50-IHL-RAT-4	U-	0.04-10				
PYRIDOXINE HYDROCHLORIDE	S		204-M											
PYRIDYL MERCURIC ACETATE														
PYROCATETHOL	S	10-118	105-M					3890-K-LD50-ORL-RAT-4				3890		
PYROGALLOL	S	10-167	133-M					789-K-LDLO-ORL-RAT-4				789		
PYRVINIUM PAMOATE														
QUASSIN	S													
QUATERNARY AMMONIUM NAPHTHENATE														
QUINACRINE HYDROCHLORIDE	S		241-D					714-K-LDLO-ORL-CKN-4						
QUINHYDRONE	S		171-M					225-K-LDLO-ORL-RAT-4						
QUININE	S													
QUINONE	S		115-M	0.4		1		320 - LCLO-IHL-MUS-4						
RAPESEED OIL	L		163-F										P-	80238
RDX (CYCLOTRIMETHYLENE TRINITRAMINE)	S		202-M	1.5		1		200-K-LD50-ORL-RAT-4				200		
RESORCINOL (SEE M-DIHYDROXY BENZENE)	S	1-108	110-M	2		1		301-K-LD50-ORL-RAT-4				301	I-	735
RHODAMINE TONER								2-K-LDLO-IPR-MUS-4						
RHODIUM (METAL FUME AND DUSTS)	S		1985-M	0.1		1								
RHODIUM (SOLUBLE SALTS)	S		1985-M	.001		1								
D-RIBOSE-5-PHOSPHORIC ACID														
RICE BRAN OIL	L													
RICINOLEIC ACID	L		22[illegible]-B					60-K-LDLO-SCU-RAT-4						
ROCK WOOL (ALSO MINERAL WOOL,SLAG WOOL)	S			10		1								
ROSIN	S		100-M											
SAFFLOWER OIL	L												U-	320
SALICYLALDEHYDE	L	1-33	196-B					1000-K-LDLO-SCU-RAT-4						
SALICYLHYDRAZINE														
SALICYLIC ACID (SEE O-HYDROXYBENZOIC ACID)	S	1-114	159-M					891-K-LD50-ORL-RAT-4				891		
SELENIUM (COMPOUNDS)	S	1-356	17[illegible]-M	0.2		1		7-K-LD50-ORL-RAT-4				7	P-	426
SELENIUM DIETHYLDITHIOCARBAMATE	S					4	C	1700-K-TDLO-ORL-MUS-4						
SELENIUM DIOXIDE	S	1-157	34[illegible]-M	0.2		4		4-K-LD50-SCU-RAT-4						
SELENIUM HEXAFLUORIDE	G		-34.5-B	0.4		1		79-K-LCLO-IHL-RAT-4						
SELENIOUS ACID	S		-D											

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	ODOUR-INFO 14	15	PHY 16	17	O-RAT 18	QUANTITY 19	20
SHELLAC	L		15-F												
SILICA (AMORPHOUS)	S	10-1732	1710-M	20	*	1		3160-K-LD50-ORL-RAT-4					3160		
SILICON	S	1-1724	1420-M	10		1									
SILICON CARBIDE	S		2600-M	30	*	1									E-105996
SILICON MONOXIDE	S		1700-M												
SILICON TETRACHLORIDE	L		[illegible]					56500 - LC50-IHL-RAT-4							
SILICON TETRAHYDRIDE				0.7		1		12600 - LCLO-IHL-MUS-4							
SILVER															
SILVER ACETATE	S		-D												
SILVER AMINE NITRATE	S														
SILVER AZIDE	S		250-M												
SILVER BORATE (TETRA)	S														
SILVER BROMATE	S		-D												
SILVER BROMIDE	S														
SILVER CARBONATE	S		218-M												
SILVER CHLORATE	S		230-M												
SILVER CHLORIDE	S	1-912	455-M												
SILVER CHROMATE	S														
SILVER CITRATE	S														
SILVER CRYSTAL CATALYST															
SILVER CYANIDE	S		320-M					123-K-LD50-ORL-RAT-4					123		
SILVER DICHROMATE	S		-D												
SILVER IODATE	S		200-M												
SILVER IODIDE	S	1-820	556-M												
SILVER LACTATE	S														
SILVER NITRATE	S		212-M	.015		4		50-K-LD50-ORL-MUS-4							
SILVER OXIDE	S		-D					2820-K-LDLO-ORL-RAT-4							
SILVER PHOSPHATE	S		849-B												
SILVER SULFHATE	S		652-M												
SILVER SUPPHIDE	S		175-M												
SILVER SULPHITE	S		-D												
SOAPSTONE (ALSO TALC)	S			20	*	1									
SODA CELLULOSE															
SODIUM	S	1.2-400	98-M											U-	9775
SODIUM ACETATE (ANHYDROUS)	S		324-M					335-K-LD50-IVN-MUS-4							
SODIUM ACID PYROPHOSPHATE	S		220-M					480-K-LD50-SCU-MUS-4							
SODIUM ALGINATE	S														
SODIUM ALUMINATE	S		1650-M											U-	1345
SODIUM AMYL XANTHATE															
SODIUM ANTHRAQUINONE ALPHA-SULPHONATE															
SODIUM ASCORBATE	S		218-M												
SODIUM ARSENATE	S		86.3-M				C	4 - TCLO-IHL-HMN-4							
SODIUM ARSENITE	S							41-K-LD50-ORL-RAT-4					41		
SODIUM AZIDE	S		-D					46-K-LDLO-ORL-RAT-4							
SODIUM BENZENESULPHONATE								3200-K-LD50-ORL-MUS-4							
SODIUM BENZOATE	S							4100-K-LD50-ORL-RAT-4					4100		
SODIUM O-BENZOYL SUPPHIMIDE															
SODIUM BICARBONATE	S		270-D												
SODIUM BICHROMATE	S		100-M											I-	9645
SODIUM BISULPHATE	S		315-M												
SODIUM BISULPHITE	S							650-K-LD50-IPR-RAT-4							
SODIUM BORATE	S		741-M					210-K-TCLO-ORL-HMN-4						I-	11775
SODIUM BROMIDE	S	1-806	755-M					5000-K-LD50-IPR-MUS-4						U-	32
SODIUM P-BROMO-BENZENESULPHONATE															

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	OCCUR-INFO 14 15	PHY 16 17	O-RAT 18	QUANTITY 19	20
SODIUM N-BUTYL SULPHONATE													
SODIUM N-BUTYL XANTHATE													
SODIUM S-BUTYL XANTHATE													
SODIUM BUTYRATE													
SODIUM CACODYLATE	S		60-M					3200-K-LD50-ORL-RAT-4			3200		
SODIUM CARBONATE	S		851-M					4000-K-LDL0-ORL-RAT-4					AS-344592
SODIUM CARBONATE PEROXIDE	S		100-D										
SODIUM CARBOXYLETHYL ROSIN AMINE													
SODIUM CARBOXYLMETHYL CELLULOSE	S							8600-K-TDL0-SCU-RAT-4				U-	775
SODIUM CASEINATE	S												
SODIUM CELLULOSE XANTHATE													
SODIUM CETYL SULPHATE													
SODIUM CHLORITE	S		175-D										P-120227
SODIUM CHLORIDE	S	1-865	801-H					8200-K-TCL0-ORL-HMN-4					PI3670021
SODIUM P-CHLOROBENZENE SULPHONATE													
SODIUM CHLOROPLATINATE	S		150-M	.005			4	.0009 - TCL0-IHL-HMN-4					
SODIUM 2-CHLOROTOLUENE-4-SULPHONATE													
SODIUM 2-CHLOROTOLUENE-5-SULPHONATE													
SODIUM CHOLATE													
SODIUM CHROMATE	S		792-M					243-K-LDL0-SCU-RBT-4					
SODIUM CITRATE	S		150-D					1460-K-LD50-IPR-RAT-4				U-	115
SODIUM COPPER CYANIDE													
SODIUM CYANIDE	S	1-817	563-M	5			4	6.44-K-LD50-ORL-RAT-4			6.44	I-	4760
SODIUM DECYL SULPHATE													
SODIUM DEHYDROCHOLATE													
SODIUM 2,5-DICHLOROBENZENE SULPHONATE													
SODIUM DICHROMATE	S		100-M	0.1			4	140-K-TDL0-TMS-RAT-4					
SODIUM DIETHYLDITHIOCARBAMATE	L		16-M										
SODIUM DIMETHYLDITHIOCARBAMATE	S							1000-K-LD50-ORL-RAT-4			1000		
SODIUM 2,2-DIMETHYL-2-SILAPENTANE-5-SULPHONATE													
SODIUM DODECYLBENZENESULPHONATE	S							2000-K-LD50-ORL-MUS-4					
SODIUM DINITROPHENATE													
SODIUM 2-ETHYLHEXYL SULPHATE								4125-K-LD50-ORL-RAT-4			4125		
SODIUM ETHYL XANTHATE	S												
SODIUM FERROCYANIDE	S												
SODIUM FLUORIDE	S	1-1077	980-M	5.5			4	4-K-LDL0-ORL-HMN-4				U-	152
SODIUM FLUOROACETATE	S		200-D	0.05			1	220-K-LD50-ORL-RAT-4			220		
SODIUM FLUOROBORATE													
SODIUM FORMALDEHYDE BISULPHITE	S							3200-K-LDL0-ORL-RAT-4					
SODIUM FORMATE	S		253-M					807-K-LD50-IVN-MUS-4					
SODIUM GLUCONATE	S												
SODIUM GLUTAMATE	S							1660-K-LD50-ORL-RAT-4			1660	I-	1955
SODIUM HEXAHYDROXYPLATINATE													
SODIUM HEXAMETAPHOSPHATE	S							140-K-LDL0-IVN-RBT-4					
SODIUM HYDRIDE	S		800-M										
SODIUM HYDROSULPHIDE	S		350-M					650-K-LD50-IPR-RAT-4					
SODIUM HYDROSULPHITE	S		55.5-M										
SODIUM HYDROXIDE	S	1-739	318-M		2		1	500-K-LDL0-ORL-RBT-4					PI1114519
SODIUM HYPOCHLORITE	S		-D									U-	140
SODIUM IODATE	S		-D					75-K-LDL0-IVN-RBT-4					
SODIUM IODIDE	S		651-M					4340-K-LD50-ORL-RAT-4			4340		
SODIUM ISOPROPYL XANTHATE	S		150-D										
SODIUM ISOTHIONATE													
SODIUM LAURCYL-N-METHYL TAURIDE													

COMPOUND NAME	PHYSICAL-PROPERTIES			TLV-TWA-CAR				TOXIC-TEST-DATA	ODOUR-INFO		PHY		O-RAT	QUANTITY	
	1	2	3	4	5	6	7	8 9 10 11 12 13	14	15	16	17	18	19	20
SODIUM LAURYL ETHER SULPHATE															
SODIUM LAURYL ETHER SULPHOSUCCINATE															
SODIUM LAURYL MONOETHANOLAMIDE SULPHOSUCCINATE															
SODIUM LAURYL SULPHATES	S							1288-K-LD50-ORL-RAT-4					1288		
SODIUM LIGNOSULPHONATES															
SODIUM LITHOCHOLATE															
SODIUM METASILICATE,ANHYDROUS	S		1089-M												
SODIUM METASILICATE,PENTAHYDRATE			100-D												
SODIUM-N-METHYL-N-OLEYLTAURATE	S														
SODIUM MONO-HYDROGEN PHOSPHATE								250-K-LD50-IMS-RAT-4							
SODIUM NAPHTHALENE B-SULPHONATE	S														
SODIUM NAPHTHENATE	S														
SODIUM N-1-NAPHTHYL-PHTHALAMATE															
SODIUM NITRATE	S		306-M					200-K-LDLO-ORL-RAT-4						UE-	40625
SODIUM NITRITE	S		271-M					3-K-LDLO-ORL-HMN-4							
SODIUM M-NITROBENZENE SULPHONATE	S														
SODIUM 4-NITROCHLOROBENZENE SULPHONATE															
SODIUM NITROPRUSSIDE	S							20-K-LDLO-ORL-RAT-4							
SODIUM-4-NITROTOLUENE-2-SULPHONATE															
SODIUM OLEATE	S		232-M												
SODIUM OLEYL SULPHATE															
SODIUM ORTHOSILICATE	S		1018-M												
SODIUM OXALATE	S		250-D					100-K-LDLO-SCU-MUS-4							
SODIUM OXIDE	S		1275-B												
SODIUM PENTACHLOROPHENATE (SEE BIOCIDES)	S							164-K-LDLO-SKN-MUS-4							
SODIUM PERBORATE	S		62-M					539-K-LD50-IPR-MUS-4							
SODIUM PERCHLORATE	S		462-M					596-K-LD50-IPR-MUS-4							
SODIUM PEROXIDE	S		460-M												
SODIUM PHENOLATE	S														
SODIUM P-PHENOL SULPHONATE	S		-D												
SODIUM PHOSPHATE,DIBASIC								2000-K-LDLO-IPR-MUS-4						U-	75310
SODIUM PHOSPHATE,MONOBASIC								250-K-LD50-IMS-RAT-4						U-	75310
SODIUM PICRAMATE	S														
SODIUM-POTASSIUM ALLOY	S														
SODIUM PROPIONATE	S							1640-K-LD50-SKN-RBT-4							
SODIUM PRUSSIATE,RED	S													U-	122
SODIUM PRUSSIATE,YELLOW	S													U-	122
SODIUM PYROPHOSPHATE	S		880-M					40-K-LDLO-ORL-MUS-4							
SODIUM SALICYLATE	S							700-K-LDLO-ORL-MUS-4							
SODIUM SELENATE	S			0.2		4		9-K-LDLO-ORL-DOG-4							
SODIUM SELENITE	S			0.2		4		7-K-LDLO-ORL-RAT-4					7		
SODIUM SESQUICARBONATE	S		-D											I-	4570
SODIUM SESQUISILICATE	S														
SODIUM SILICATE	S													U-	30015
SODIUM STANNATE	S		140-D											U-	41605
SODIUM STEARATE	S							400-K-LDLO-UNK-MUS-4							
SODIUM SULPHAMETHAZINE															
SODIUM SULPHATE	S		888-M					4470-K-LDLO-IVN-RBT-4						PI-	542888
SODIUM SULPHYDRATE	S		350-M												
SODIUM SULPHIDE	S		1180-M					53-K-LD50-IPR-MUS-4						I-	1215
SODIUM SULPHITE	S		-D					115-K-LD50-IVN-RAT-4						I-	5570
SODIUM TARTRATE	S		150-D					1290-K-LD50-ORL-RAT-4					1290		
SODIUM TETRAPHENYLBORON															
SODIUM THIOCYANATE	S		287-M					764-K-LD50-ORL-RAT-4					764		

COMPOUND NAME	PHYSICAL-PROPERTIES			TLV-TWA-CAR				TOXIC-TEST-DATA	ODOUR-INFO	PHY	O-RAT	QUANTITY
	1	2	3	4	5	6	7	8 9 10 11 12 13	14 15 16	17	18	19 20
SODIUM THIOSULPHATE	S		48-M									
SODIUM TOLUENE SULPHONATE	S											
SODIUM TRIBASIC PHOSPHATE	S		75-D									
SODIUM TRIDECYL ETHER SULPHATE												
SODIUM TRIDECYL SULPHATE												
SODIUM TRIPHOSPHATE	S		662-M					700-K-LD50-IPR-MUS-4				
SODIUM TRIPOLYPHOSPHATE	S		662-M					700-K-LD50-IPR-MUS-4				U- 51375
SODIUM VALERATE												
SODIUM XYLENE SULPHONATE												
SORBIC ACID	S	0.01-20	134.5-M					5000-K-LDLO-UNK-HMN-4				
SORBIDE MONOSTEARATE	S		54-M									
SORBITAN FATTY ESTERS	L											
SORBITAN MONOLAURATE	S		54-M									
SORBITAN MONOPALMITATE	S		54-M									
SORBITAN MONOSTEARATE	S		54-M									
SORBITAN SESQUIOLEATE	S		54-M									
SORBITAN TRISTEARATE	S		54-M									
SORBITOL	S		93-M									
SORBITOL HEXAOLEATE,ETHOXYLATED												
SORBITOL MONOOLEATE	S		54-M									
SORBITOL SEPTAOLEATE,ETHOXYLATED												
SOYBEAN OIL	L		22.2-M									IE- 97097
SPERM OIL	L		220-B									
STANNIC CHLORIDE	L	10-10	114-B	4		4		46-K-LD50-IPR-MUS-4				
STANNOUS CHLORIDE	S		37-M	3.2		4		20-K-LDLO-IVN-DOG-4				
STANNOUS 2-ETHYLHEXOATE	L											
STARCH	S											
STEARIC ACID	S	1-174	69.3-M									U- 2815
STEARYLAMIDE								250-K-LDLO-IPR-MUS-4				
STEARYLAMINE,ETHOXYLATED												
STEARYL BENZYL AMMONIUM CHLORIDE												
STEARYL CETYL ALCOHOL, ETHOXYLATED												
STEARYL CETYL SULPHATE												
STEARYL DIMETHYL BENZYL AMMONIUM CHLORIDE								4000-K-LD50-ORL-HMN-4				
STEARYL SULPHATE												
STIBINE (ALSO ANTIMONY HYDRIDE)	G		-17-B	0.5		1		511 - LCLO-IHL-MUS-4				
STRONTIUM	S	10-898	1150-B									
STRONTIUM ACETATE	S		150-D					123-K-LDLO-IVN-RAT-4				
STRONTIUM CHLORIDE	S		1250-B					123-K-LDLO-IVN-RAT-4				
STRONTIUM CHROMATE	S											
STRONTIUM FERRITE												
STRONTIUM LACTATE								900-K-LD50-IPR-RAT-4				
STRONTIUM NITRATE	S		570-M					540-K-LD50-IPR-RAT-4				
STRYCHNINE	S		268-M	0.15		1						
STYRENE MONOMER	L		146-B	420		1		1660 - TCLO-IHL-HMN-4	R- 0.2 - 6			U- 37250
4-STYRYL PYRIDINE												
SUCCINIC ACID	S		185-M					2000-K-LDLO-SCU-FRG-4				
SUCCINIC ACID 2,2-DIMETHYL HYDRAZIDE	S		155-M									
SUCCINYL CHLORIDE								62-K-LD50-IPR-MUS-4				
SUCROSE	S		160-D									U-182560
SULPHADIAZINE												
SULPHOXIDE	L							2000-K-LD50-ORL-RAT-4			2000	
SULPHUR (SEE FUNGICIDES)	S	1-184	112.8-M									PI3833305
SULPHUR DIOXIDE	G	2538-21.1	-10-B	13		1		8 - TCLO-IHL-HMN-4	U- 1.23- 9	P		U- 37255

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	ODOUR-INFO 14 15	PHY 16	17	O-RAT 18	QUANTITY 19	20
SULPHUR HEXAFLUORIDE	G		63.8-B	6000		1								
SULPHURIC ACID		1-146	330-B	1		1		5 - TCLO-IHL-HMN-4	U- 0.60- 3				PI2739263	
SULPHUR MONOCHLORIDE	L	10-27.5	138-B	6		1		830 - LCLO-IHL-MUS-4	U-0.0055-14					
SULPHUROUS ACID	L													
SULPHUR TETRAFLUORIDE	G		-40-B	0.4		1								
SULPHUR TRIOXIDE	L	100-10.5	44.8-B											
SULPHURYL FLUORIDE	G		-52 B					100-K-LDLO-ORL-RAT-4						
SUNFLOWER OIL	L													
SUPERPHOSPHATES													PI-	16506
TALC (NON ASBESTIFORM)	S			20	*	1							U-224485	
TALL OILS	L		182-B											
TALLOW	S		86-M										U-	15175
TANNIC ACID	S		200-K					5000-K-LD50-ORL-RBT-4						
TANTALUM (METAL AND OXIDE DUSTS)	S		3027-M	5		1								
TANTALUM CARBIDE	S		5550-B											
TANTALUM-NIOBIUM CARBIDE														
TAR (LIQUID)	L													
TARTARIC ACID	S		168-M					5000-K-LDLO-ORL-DOG-4						
TDE (SEE DICHLORODIPHENYLDICHLOROETHANE INSECTICIDES)	S		110-M					400-K-LD50-ORL-RAT-4				400	U-	315
TEAR GAS														
TEDP (TETRAETHYL DITHIONOPYROPHOSPHATE)				0.2		1		5-K-LD50-ORL-RAT-4				5		
TELLURIUM	S	1-520	452-M	0.1		1								
TELLURIUM DIOXIDE	S		1245-B										P-	33
TELLURIUM HEXAFLUORIDE	G		-35.5-B	0.2		1		49 - LC50-IHL-RAT-4						
TERPENE ALCOHOL														
TERPHENYLS				9.4		1		500-K-LDLO-ORL-RAT-4						
TESTOSTERONE	S		155-M											
TETRABROMOETHANE	L		151-D	14		1		400-K-LD50-ORL-R2T-4						
1,2,4,5-TETRACHLOROBENZENE	S		47.5-M											
1,1,1,2-TETRACHLORO 1,2-DIFLUOROETHANE				4170		1								
1,1,1,2-TETRACHLORO 2,2-DIFLUOROETHANE				4170		1		30 - TDLO-ORL-HMN-4						
1,1,2,2-TETRACHLOROETHANE	L		146.3-B	35		1		6980 - LCLO-IHL-RAT-4						
TETRACHLOROHYDROQUINONE														
TETRACHLORONAPHTHALENE	S		182-M	2		1		3-K-TCLO-IHL-HMN-4						
TETRACHLOROPHENOL	S		164-B					140-K-LD50-ORL-RAT-4				140		
TETRAETHYL LEAD	L	1-38.4	198-B	0.12		1		60 - LCLO-IHL-RAT-4						
TETRAETHYL THIURAM SULPHIDE	S		225-D					1000-K LD50-IPR-MUS-4						
TETRAHYDROFURAN	L	114-15	65.4-B	590		1		3000-K-LDLO-ORL-RAT-4	U- 88.00- 8					
TETRAMETHYL LEAD	L		-22-B	0.15		1		109-K-LD50-ORL-RAT-4				109		
TETRAMETHYL-P-PHENYLENE DIAMINE	S		51-M											
TETRAMETHYL SUCCINONITRILE (TSN)	S		165-S	2.8		1		335 - LCLO-IHL-RAT-4						
TETRAMETHYL THIURAM DISULPHIDE	S		70-M	5		4		250-K-TDLO-ORL-MUS-4						
TETRAMETHYL THIURAM MONOSULPHIDE	S							300-K-LDLO-IPR-MUS-4						
2,3,4,5-TETRANITROBENZANILIDE														
TETRANITROMETHANE	S	10-22.7	125.7-B					270 - LCLO-IHL-RAT-4						
TETRAPHENYLETHANE														
TETRAPROPYLENE														
TETRASODIUM ETHYLENEDIAMINETETRAACETATE								330-K-LD50-IPR-MUS-4						
TETRASODIUM PYROPHOSPHATE	S		880-M					40-K-LDLO-ORL-MUS-4					U-	1235
TETRAZENE	S													
TETRAZOLE														
TETRYL	S		130-M	1.5		1		5000-K-LDLO-SCU-DOG-4						
THALLIUM	S	1-825	302-M	0.1		1		0.8-K-TDLO-ORL-RAT-4				0.8		

COMPOUND NAME	PHYSICAL-PROPERTIES			TLV-TWA-CAR				TOXIC-TEST-DATA	ODOUR-INFO	PHY	O-RAT	QUANTITY
	1	2	3	4	5	6	7	8 9 10 11 12 13	14 15 16 17	18	19	20
THALLIUM SULPHATE	S		632-M					16-K-LD50-ORL-RAT-4		16		
THIOCARBAMIDE	S		160-M					1660-K-LDLO-ORL-HMN-4				
THIOPHENE	L	40-12.5	84.1-B					100-K-LDLO-IPR-MUS-4	U-0.0028-11			
THIOUREA	S		160-M					1660-K-LDLO-ORL-HMN-4				
THORIUM	S		1845-M									
THORIUM DIOXIDE	S		4400-B									
THYROTROPIC HORMONE												
TIN (INORGANIC COMPOUNDS)				2	U							
TIN (ORGANIC COMPOUNDS)				0.1		1						
TITANIUM	S		1800-M								I-	290
TITANIUM CARBIDE	S		4300-B									
TITANIUM DIOXIDE	S		1640-M	10		1					PI-855659	
TITANIUM SULPHATE	S											
TITANIUM TETRACHLORIDE	L	10-21.3	136.4-B					10 - LCLO-IHL-MUS-4				
TOLUENE	L	36.7-30	110.4-B	375		1		375 - TCLO-IHL-HMN-4	U- 1.80-10		U-	54113
TOLUENE DIISOCYANATE	L		118-B	0.02		1		3.6 - TCLO-IHL-HMN-4	U- 15.20- 9			
O-TOLUENE SULPHONIC ACID	S		129-B									
P-TOLUENE SULPHONIC ACID	S		107-M					400-K-LD50-ORL-RAT-4		400		
O-TOLUIDINE	L	1-44	200-B	22		1		900-K-LD50-ORL-RAT-4		900		
TOXAPHENE (SEE CHLORINATED CAMPHENE	S		65-B	0.5		1		60-K-LDLO-ORL-RAT-4		60		
SEE INSECTICIDES)												
TRIAMCINOLONE	S		264-M					99-K-LD50-SCU-RAT-4				
1,2,4-TRIAZOLE												
TRIBROMOPHENOL	S		94-B					200-K-LD50-ORL-RAT-4		200		
TRIBUTOXYETHYL PHOSPHATE	L	0.03-150	200-B					3000-K-LD50-ORL-GPG-4				
TRI-N-BUTYLAMINE	L		213-B					575 - LCLO-IHL-RAT-4				
TRI-N-BUTYL BORINE	L		71-B									
TRIBUTYL BORATE	L		230-B					1740-K-LD50-ORL-MUS-4				
TRIBUTYL PHOSPHATE	L		209-B	5		1		3000-K-LD50-ORL-RAT-4		3000		
TRI-N-BUTYLTIN ACETATE				0.1		1		99-K-LD50-ORL-RAT-4		99		
TRICYCLOHEXYLTIN HYDROXIDE (ALSO PLICTRAN)				5		1						
1,2,4-TRICHLOROBENZENE	L	1-38.4	213-B					756-K-LD50-ORL-RAT-4		756		
1,1,1-TRICHLOROETHANE	L	100-20	74.1-B	1900		1		1940 - TCLO-IHL-HMN-4	U- 2180- 8			
1,1,2-TRICHLOROETHANE	L	40-35.2	114-B	45		1		2775 - LCLO-IHL-RAT-4				
TRICHLOROETHYLENE	L	100-32	87.1-B	535		1		600 - TCLO-IHL-HMN-4	R-115.00- 6		I-	2080
TRICHLOROFLUOROMETHANE	L		24.1-B	5600		1			U-969000-10			
TRICHLORONAPHTHALENE	S			5		1		30-K-TCLO-IHL-MUS-4				
3,4,6-TRICHLORO-1-NITROPHENOL	S		93-M									
2,4,5-TRICHLORO-3-NITROSALICYLANILIDE												
2,4,6-TRICHLOROPHENOL (SEE BIOCIDES)	S	1-72	252-B					820-K-LD50-ORL-RAT-4		820		
1,2,3-TRICHLOROPROPANE	L		142-B	300		1		320-K-LD50-ORL-RAT-4		320		
TRICHLOROTOLUENE	L		214-B									
TRICHLOROTRIFLUOROETHANE	L		45.6-B	7600		1		35000 - TCLO-IHL-HMN-4				
TRICRESYL PHOSPHATE	L		410-B								I-	860
TRICYCLOHEXYL BORATE	S		55-M									
TRIDECYL ALCOHOL	L		252-B					4750-K-LDLO-ORL-RAT-4				
TRIDECYLBENZENE	L											
TRIDECYL (ETHOXY) PHOSPHORIC ACID												
TRIETHANOLAMINE	L	10-205	360-B					8000-K-LD50-ORL-GPG-4			U-	820
TRIETHYLALUMINIUM	L	4-83	194-B	100		1						
TRIETHYLAMINE	L		89.5-B					4210 - LCLO-IHL-RAT-4	U- 1.16- 7			
TRIETHYLENE GLYCOL	L	1-114	291-B					9739-K-LD50-SCU-MUS-4				
TRIETHYLENE GLYCOL MONOBUTYL ETHER	L		-B					3540-K-LD50-SKN-RBT-4				
TRIETHYLENE GLYCOL MONOETHYL ETHER												

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5 6 7	TOXIC-TEST-DATA 8 9 10 11 12 13	ODOUR-INFO 14 15	PHY 16 17	O-RAT 18	QUANTITY 19 20
TRIETHYLENE GLYCOL MONOMETHYL ETHER	L		249-B							
TRIETHYLENE TETRAMINE	L	0.01-20	278-B			4340-K-LD50-ORL-RAT-4			4340	
TRI (2-EHTYLHEXYL) TRIMELLITATE										
TRIETHYLSTIBINE (SEE ANTIMONY TRIETHYL)	L		159.5-B							
TRIFLUPROMAZINE HYDROCHLORIDE	S		173-D			0.29-K-TCLO-ORL-HMN-4				
3-TRIFLUOROMETHYL-4-NITROPHENOL						40-K-LDLO-IPR-MUS-4				
TRIFLUOROMONOBROMOMETHANE				6100	1					
A,A,A-TRIFLUORO-4-NITRO-M-CRESOL										
TRIFLUOROTRICHLOROETHANE	G		-46-B				U-521.00- 8			
TRIIODOPHENOL	S									
TRIISOBUTYLALUMINUM	L	1-47	-D							
TRIISOOCTYL TRIMELLITATE	L		275-B							
TRIISOPROPANOLAMINE	S	0.01-20	45-M			1080-K-LD50-ORL-GPG-4				
TRIISOPROPYL BORATE	L		141-B			2500-K-LD50-ORL-MUS-4				
TRIMETHOXYBENZENE										
TRIMETHYLAMINE	G		2.9-B			75-K-LDLO-IPR-MUS-4	R-.00051- 6			
1,2,4-TRIMETHYLBENZENE				120	1	2000-K-LDLO-IPR-RAT-4				
2,2,4-TRIMETHYL (3-PHENYLISOPROPYL)-1,2-DIHYDROQUINOLINE										
TRIMETHYL AND TRIMETHYLOCTADECADIENYL AMMONIUM CHLORIDES										
TRIMETHYLOLETHANE	S									I- 445
TRIMETHYLSTIBINE (SEE ANTIMONY TRIMETHYL)	L		80.6-B			1370-K-LDLO-SCU-CAT-4				
3,3,5-TRINITROBENZANILIDE										
TRINITRORESORCINOL	S		180-M							
TRINITROTOLUENE	S		80.7-M	1.5	1	700-K-LDLO-ORL-RAT-4				
TRIORTHOCRESYL PHOSPHATE				0.1	1	3000-K-LD50-ORL-RAT-4			3000	
TRIPHENYLBORATE	S		35-M			200-K-LD50-ORL-MUS-4				
TRIPHENYLCHLOROMETHANE										
TRIPHENYL PHOSPHATE	S	1-193	48.5-M	3	1	3000-K-LDLO-ORL-RAT-4				
2,3,5-TRIPHENYLTETRAZOLIUM CHLORIDE	S		245-D							
TRIPHENYLTIN ACETATE				0.1	4	81.3-K-LD50-ORL-MUS-4				
TRIPHENYLTIN CHLORIDE	S		106-M							
TRI-N-PROPYLAMINE	L		156-B			1490 - LCLO-IHL-RAT-4				
TRIPROPYLENE GLYCOL	L	1-96	267-B			3000-K-LD50-ORL-RAT-4			3000	
TRI-N-PROPYLTIN IODIDE	L		262-B							
TRISODIUM ETHYLENEDIAMINETETRAACETATE	S									
TRISODIUM HYDROXYETHYL ETHYLENEDIAMINETRI-ACETATE	L									
TRISODIUM NITRILOTRIACETATE						681-K-LD50-ORL-MUS-4				
TRITYLTHYMIDINE										
TRYPAFLAVINE						11-K-LDLO-IPR-MUS-4				
TRYPSIN	S					650-K-LD50-IPR-MUS-4				
TUNG OIL	L		250-F							I- 854
TUNGSTEN (SOLUBLE)	S	1-3990	3370-M	1	1					
TUNGSTEN (INSOLUBLE)				5	1					
TUNGSTEN TITANIUM CARBIDE										
TURPENTINE	L		154-B	560	1	420 - TCLO-IHL-HMN-4				U- 1322
URANIUM AND COMPOUNDS	S		1132-M	0.2	1					
URANYL ACETATE	S		110-M	0.2	4	400-K-LD50-IPR-MUS-4				
URANYL NITRATE	S		60-M							
URANYL SULPHATE	S		100-D							
UREA	S		132.7-M							PI-371215
UREA FORMALDEHYDE RESINS										AS- 19035

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-THA-CAR 4	5	6	7	TOXIC-TEST-DATA 8 9 10 11 12 13	OCCUR-INFO 14 15	PHY 16	17	O-RAT 19	QUANTITY 19	20
UREA PHOSPHATE								4000-K-LD50-SCU-MUS-4						
UREA SULPHATE														
VALERIC ACID	L		187-B						U-.00083-11					
VANADIUM PENTOXIDE (FUME)				0.5		1		1 - TCLO-IHL-HMN-4						
VANADIUM PENTOXIDE (DUST)	S		690-M	5		1								
VANADIUM SULPHIDE	S		-D											
VANADYL SULPHATE	S													
VANILLIN	S		81-M					1580-K-LD50-ORL-RAT-4	U.000001- 8			1050	U-	15
VINYL ACETATE (MONOMER)	L	100-21.5	73-B	30		1		14325 - TCLO-IHL-RAT-4	U- 1.41-12				U-	11125
VINYL BROMIDE (ALSO BROMOETHYLENE)	G		15.6-B	1100		1		500-K-LD50-ORL-RAT-4				500		
VINYL BUTYRATE	L		116-B					15000 - LCLO-IHL-RAT-4					I-	1725
VINYL CHLORIDE (MONOMER)	G	2600-25	-13.4-B	770		1		32 - TCLO-IHL-[illegible]-4					U-	130000
VINYLIDENE CHLORIDE	L		31.6-B	10		1		400-K-LDLO-ORL-RAT-4					I-	2760
VINYLTOLUENE	L		170-B	480		1		4900-K-LDLO-ORL-RAT-4						
WARFARIN	S		161-M	0.1		1		325-K-LD50-ORL-RAT-4				325		
WOOD DUST				5		1								
XANTHIC ACID	L		22-D											
XENON	G		-107.1-B											
XYLENES	L	13-27.3	138.3-B	440		1		750 - TCLO-IHL-HMN-4	O-.00018- 6				U-	49180
XYLENOL	S	1-62	68-B					1070-K-LD50-ORL-MUS-4						
XYLIDINE (ALSO AMINODIMETHYLBENZENE)	L		213-B	25		1		610-K-LDLO-ORL-RAT-4						
YTTRIUM	S		1500-M	1		1								
ZINC	S	1-487	419.4-M										UE-	468785
ZINC ACETATE	S		242-D											
ZINC AMMONIUM BISULPHITE														
ZINC AMMONIUM CHLORIDE	S												U-	105
ZINC ARSENATE	S		100-D											
ZINC ARSENITE	S													
ZINC BOROFLUORIDE														
ZINC CHLORIDE (FUME)	S	1-428	262-M	1		1		4800 - TCLO-IHL-HMN-4					U-	635
ZINC CHROMATE	S												U-	490
ZINC CYANIDE	S		800-D					100-K-LDLO-IPR-RAT-4						
ZINC DIBUTYL DITHIOCARBAMATE	S		104-M											
ZINC DIETHYL DITHIOCARBAMATE	S		172-M					570-K-LD50-ORL-RBT-4						
ZINC DIMETHYL DITHIOCARBAMATE	S		248-M					100-K-LDLO-ORL-RBT-4						
ZINC DUST	S	1-487	419.4-M										I-	711
ZINC 2-ETHYLHEXOATE	L													
ZINC HYDROSULPHITE	S		200-D										U-	7255
ZINC ISODECANOATE														
ZINC LAURATE	S		128-M											
ZINC LIGNOSULPHONATES														
ZINC MERCAPTOBENZOTHIAZOLE	S		300-M					540-K-LD50-ORL-RAT-4				540		
ZINC NAPHTHENATE	S							4920-K-LDLO-ORL-RAT-4				4920		
ZINC NEODECANOATE														
ZINC NITRATE	S		45.5-M											
ZINC OXIDE (FUME)	S		1800-M	5		1		400 - LDLO-IHL-RAT-4					U-	10205
ZINC PERMANGANATE	S		100-M											
ZINC PEROXIDE	S		150-D											
ZINC SELENIDE	S		1100-M											
ZINC STEARATE	S		130-M	10		1							U-	15
ZINC SULPHATE	S		740-D					2.5-K-TDLO-SCU-RBT-4					I-	1660
ZINC SULPHIDE	S		1850-M											
ZINC TALLATE														
ZIRCONIA	S		2700-M										I-	104

COMPOUND NAME	PHYSICAL-PROPERTIES 1	2	3	TLV-TWA-CAR 4	5	6	7	TOXIC-TEST-DATA 8	9	10	11	12	13	ODOUR-INFO 14	15	16	PHY 17	O-RAT 18	QUANTITY 19	20
ZIRCONIUM COMPOUNDS	S		1900-K	5		1														
ZIRCONIUM NAPHTHENATE	L																		U-	45
ZIRCONIUM OCTOATE																			U-	45
ZIRCONIUM OXYCHLORIDE	S		150-D					3500-K-LD50-ORL-RAT-4										3500		
ZIRCONIUM SULPHATE	S		100-D					3500-K-LD50-ORL-RAT-4										3500		
ZIRCONIUM TETRAFLUORIDE	S							93-K-LD50-IVN-MUS-4												
ZIRCONYL NITRATE (BASIC)	S							2500-K-LD50-ORL-RAT-4												

05.04 On-going Priority Substances

05.04.01 List of Summaries

Asbestos

Polychlorinated Biphenyls (PCB's)

Vinyl Chloride

ASBESTOS

Physical and Chemical Properties

Asbestos is a generic term which refers to a group of fibrous hydrated silicate minerals of the serpentine and amphibole groups. Customarily included in the definition of asbestos are chrysotile (serpentine); amosite, crocidolite, anthrophyllite, tremolite, and actinolite (all amphiboles). These minerals have complex chemical compositions which distinguish them from one another. The chemical composition changes, sometimes significantly, with exposure to the environment, making it very difficult to identify positively individual fibre types in environmental samples by means of elemental analysis. These properties are discussed in Section 4 of the report "Asbestos as a Hazardous Contaminant" (ARB-TDA-01-75) (Reference 1).

Potential Emission Sources

Sources are discussed in detail in Section 5 of Reference 1.

Health Effects

Asbestos has been occupationally linked with a potentially fatal disease, asbestosis. It was later associated with malignant carcinomas of the lung, gastrointestinal tract, stomach and a very rare cancer of the peritoneum or pleura, mesothelioma. In general, the available data and information are only pertinent to the high concentrations experienced in occupational exposure.

Asbestosis is considered by most authorities to be strictly an occupational hazard requiring at least several years of heavy asbestos exposure to concentrations of fibres well above those found in ambient air.

As most of the clinical experience relates to occupational exposures, there seems to be little evidence of a significant threat of asbestos-induced carcinomas to the health of the general public. Some effects are detectable in occupational environments where overall exposures are minimal, but is seems likely that these exposures are greatly in excess of those in urban communities. Unlike asbestosis, asbestos-related cancers seem to follow no well-defined dose-response and threshold level relationship. Very short exposure to a high concentration of asbestos dust or chronic exposure to a very low concentration may both lead to the induction of cancer after a typically long latent period following first exposure. Therefore, a "safe level" of exposure for either occupational or community cancer risk has not been established. Current data on asbestos-induced carcinomas of the lung seem to indicate that the only portion of the population at risk of cancer are people indirectly exposed to asbestos (i.e. family of asbestos worker or living in the vicinity of a heavily emitting asbestos processing centre).

Mesothelioma, a rare cancer (incidence in Canada:one/million population/year), seems to be the most serious asbestos-induced threat to the health of the general population at this time. Most cases in which environmental data are available have been characterised by potential or actual asbestos exposure, frequently occupational and often that associated with residence within 1/2 mile of an asbestos plant, or within the household of an asbestos worker. These exposures have often been of short duration (weeks to months) with a latency period of 20-30 years.

Early evidence gathered in South Africa and England seemed to implicate one of the several varieties of asbestos fibres, namely crocidolite (blue), as particularly dangerous in inducing mesothelioma. Non-occupationally contracted cases of mesothelioma, involving crocidolite, were identified in these areas. Recently, Selikoff (Mt. Sinai Medical School, New York) found comparable numbers of non-occupationally contracted mesothelioma asssociated with the amosite (brown) variety of asbestos. Studies involving the chrysotile (white) variety conducted in Canada, Italy, and Cyprus indicate only a few occupational excess deaths due to mesothelioma.

All varieties of asbestos which have been tested are capable of causing epithelial cancers by inhalation, so the question is one of level of exposure, not of ability or inability to act as a carcinogen.

Environmental and Occupational Air Standards

The current Ontario Occupational Health Standard is 2 fibre/cm^3 greater than 5 um in length (8-hour TWA). The U.S. Occupational Health Standard was to become 2 f/cm^3 (on the same basis as above) by June 1976, but a recent proposal by OSHA sets forth a 0.5 f/cm^3 standard ($>$ 5 um length, $<$5 um width), promulgation date to be set. The Ontario Ambient Air Quality Guideline is 0.04 f/cm^3 ($>$ 5 um in length) averaged over 24 hours. The Provincial Design Guideline is 5 ug/m^3 (all fibre lengths) averaged over 30 minutes at a point of impingement. The proposed Environment Canada National Emission Standard for asbestos fibres is 2 f/cm^3 ($>$ 5 um in length) at the source to apply only to mining and milling operations. This same standard has been promulgated by the Quebec Government.

The Department of Health and Welfare and Consumer and Corporate Affairs have announced intent to ban the importation of crocidolite (blue) asbestos and the sale of consumer products containing free asbestos fibres under the authority of the Hazardous Products Act.

Sampling and Analytical Methods

Asbestos fibres in ambient air are sampled on various filter media by methods suitable for airborne particulate matter. Membrane or polymer fibre filters may be used with either high volume or low volume samplers. Polycarbonate or cellulose acetate membrane filters or polystyrene fibre filters have been used successfully to collect asbestos fibres. The currently recommended filter media are polycarbonate membrane or polystyrene fibre filters in 8" X 10" size for use with a high-volume sampler. The sampler should incorporate a feedback electronic flow controller, if possible, because of the restricted flow through membrane filters, especially. The air sample should comprise at least 200 m^3 (0.7 m^3/min. for 4 to 24 hours) on 8" X 10" filters or at least 10 m^3 (0.05 m^3/min for 4 to 24 hours) on 47 mm diameter filter discs.

Analysis of ambient samples must be carried out by electron microscopy and fibre counting techniques for compliance testing with respect to fibre number or mass concentration guidelines. See references (2) and (3) for an evaluation of sampling methods and media.

Control and Abatement Techniques

These techniques are well summarised in reference 1. Reports on asbestos fibre control technology and process

substitutes for asbestos fibres are being prepared by Techno-logy Development and Appraisal Section.

REFERENCES FOR ASBESTOS SUMMARY

File: Approximately 200 articles and reports on all of the above aspects of asbestos.

1. MOE Report, "Asbestos as a Hazardous Contaminant" (ARB-TDA-01-75)
2. MOE Report, "Asbestos as a Hazardous Contaminant, Progress Report I" (ARB-TDA-16-75)
3. MOE Report, "Asbestos as a Hazardous Contaminant, Progress Report II (ARB-TDA-20-76)

POLYCHLORINATED BIPHENYLS

Physical and Chemical Properties

Polychlorinated biphenyls (PCB's) are normally encourntered as mixtures of molecular isomers which have one to ten chlorine atoms per molecule. Current commercial PCB products manufactured in North America are fluid mixtures containing 21, 42, or 54% by weight chlorine. Fully chlorinated biphenyl (decachlorobiphenyl), which is imported from Italy, is a solid composed of 72% chlorine. In addition, PCB fluid products ranging from 21 to 68% chlorine content are manufactured in many countries.

Aroclor is Monsanto Corporation's trade name for its various PCB mixtures, Monsanto being the only North American manufacturer of PCB's. No PCB's are manufactured in Canada. PCB mixtures or blends of these mixtures with other materials manufactured to certain specifications for use as dielectric media in power transformers or capacitors are called askarels, a generic term covering many different manufacturers' trade names. The composition of askarels currently ranges from essentially 100% PCB's for impregnating & filling capacitors to 45 or 70% PCB's for filling transformers.

Because of their high dielectric strength and thermal stability, PCB's are destroyed completely only by high temperature incineration (1300 C or higher for one second or longer). They are resistant to biological degradation, but the lower chlorinated species can be degraded to some extent by certain activated microbial sludge systems.

The lifetime of PCB's, particularly the isomers

having five or more chlorine atoms per molecule, in air or water is not known but is believed to be very long, that is, of the order of weeks to years. The residence time in the atmosphere appears to be determined by the rate of deposition to land or surface water and not by chemical reactions.

Several studies have demonstrated that there are appreciable concentrations of PCB's in the atmosphere, ranging from about 0.5 ug/1000 m^3 over the oceans to approximately 100 ug/1000 m^3 in urban areas. Most of the airborne PCB's are in the vapour phase, considerably less than ½ of the measured amounts are found adsorbed onto particulate matter.

Potential Emission Sources

There are practically no source test data for PCB's. The bulk of emissions to the atmosphere is expected to occur from capacitor and tranformer filling facilities, evaporation losses from these electrical components in the field, municipal waste and sewage sludge incinerators, and from older PCB-filled heat exchangers and hydraulic systems, especially in refinery and metal stamping operations.

Although PCB's are virtually restricted to use in closed electrical component, their former applications in many other products and pieces of equipment continue to provide reservoirs for potential emissions to the atmosphere. PCB's may appear in waste oil supplies and in plastic and paper products in which they had been used as plasticizers.

Source testing for PCB's is currently a high priority programme within the Air Resources Branch.

Health Effects

PCB's have caused the following toxic effects in humans: chloracne, pigmentation of skin and nails, eye irritation and swelling, digestive disturbances, edema (inflammation) of face and hands. The level of exposure which would induce the above symptoms is undoubtedly considerably greater than that which is possible through strictly environmental exposure. The "Yusho" incident in Japan, in which rice oil for human consumption was contaminated by PCB's (1,500 to 2,000 ppm) from a leaking heat exchanger has recorded more than 1,200 victims who have been severely disabled by symptoms such as those listed above. Some effects were not reversible after exposure was discontinued.

Neoplastic and tumorigenic effects have been observed in human victims of PCB poisoning, and several species of mammals, including primates, have developed liver cancers and other neoplasms from ingesting relatively low levels of PCB's in the diet. These levels are generally well above those to which humans would be exposed outside of the working place.

Because of their high solubility in fatty tissue and their resistance to metabolism, PCB's accumulate from the environment into biological systems. For example, certain species of fish can concentrate PCB's in their fatty tissue to several hundred thousand times the level in the surrounding water. This means that 10 parts per trillion of PCB in water can become 2 parts per million in fish tissue, which may then be consumed by animals

higher in the food chain, including man. At least one poisoning incident among mink fed fish from PCB contaminated water has been attributed to this cause.

Environmental and Occupational Air Standards

There are no regulations in Canada or elsewhere on PCB concentrations in ambient air. The current U.S. Occupational Health Standard is 1 mg/m^3 for PCB containing 42% chlorine and 0.5 mg/m^3 for PCB containing 54% chlorine. PCB's are being considered for regulation by Environment Canada under the new Environmental Contaminants Control Act.

Sampling and Analytical Methods

Vapour-phase and particulate polychlorinated biphenyls can be sampled by a standard EPA (or equivalent) impinger sampling train. Ethylene glycol has been shown to be an appropriate impinger absorbent. Because of the predominance of PCB's in the vapour phase, high volume filter samples are not representative of total airborne PCB's.

Work is underway to develop and test a solid absorbent cartridge sampler for general purpose organic vapour sampling which should be appropriate for sampling PCB's.

The sensitivity of the impinger sampling method for a sample of about 200m^3 of air is less than one ug/1000m^3. The sensitivity and required sample volume of the solid adsorbent system have not been evaluated.

PCB determinations are performed by gas chroma-

tography or combined gas chromatography/mass spectrometry. The Trace Organic Contaminants Laboratory, Laboratory Services Branch, is equipped to carry out such analyses.

Control and Abatement

No information is available on specific control and abatement equipment for PCB's. Typical oil mist control equipment may be useful in cleaning the exhaust from vacuum systems, but good maintenance practice and restricted disposal of waste PCB's will probably contribute most to abatement of PCB emissions.

REFERENCES FOR PCB SUMMARY

File: Approximately 75 references on all aspects of PCB's except control and abatement.

1) N. Nelson (Panel on Hazardous Trace Substances), "PCB's - Environmental Impact," Environmental Research, Vol. 5, pages 249-362 (1972).
2) D.B. Peakall, "PCB's and their Environmental Effects", CRC Critical Reviews in Environmental Control, Sept. 1975, pages 469-508.
3) O. Hutzinger, S. Safe, and V. Zitko, "The Chemistry of PCB's", CRC Press, Cleveland, Ohio, 1974.

VINYL CHLORIDE

Physical and Chemical Properties

Vinyl chloride (chloroethene, chloroethylene, vinyl chloride monomer) is a colourless gas which boils at -13.8C. It has a faintly sweet odour and an odour threshold variously reported as 250-270, 400 and 4100 ppm, depending upon the inhibitor content and upon the degree of prior exposure.

More detailed properties appear on pages 2-7 of the MOE background report, "Vinyl Chloride as an Airborne Hazardous Contaminant" (Reference 1).

In the atmosphere VCM behaves as a reactive hydrocarbon with respect to nitrogen oxides and oxidants. VCM is slightly less reactive (about 2/3) than ethylene in air which is polluted by amounts of NO_x which are typical of urban or industrialised areas. The lifetime of VCM in the atmosphere under typical conditions is about one day. The major reaction products of VCM atmospheric degradation are formic acid, hydrogen chloride, carbon monoxide, formaldehyde and ozone, all of which are undesirable pollutants in the troposphere since they are irritant or corrosive substances. Almost all of the chlorine from the VCM ends up in the form of HCl under these conditions.

Potential Emission Sources

The three major categories of vinyl chloride monomer (VCM) atmospheric emission sources are VCM production facilities, polyvinyl chloride (PVC) production facilities, and PVC product fabrication facilities. Pages 8-23 of reference 1 treat these potential emissions in detail.

References 2, 3, and 4 are MOE reports concerning ambient air surveys for VCM which have been conducted by the Air Resources Branch near sources.

On the basis of these surveys, the PVC resin manufacturing plants have been identified as the major VCM emitters, closely followed by the lone VCM manufacturing plant. Although the survey of fabricating plants was cursory at best, it appears that VCM emissions are not a problem at these locations, especially since the resin manufacturers are reducing the residual monomer content of the shipped PVC to very low levels (10 ppm by weight or less for most grades).

Health Effects

The statement which appears on page 48 of reference 1 in October 1974 is still true, namely; "There is no substantial body of information relating to the effects of community exposure to vinyl chloride monomer". In fact, to date, there are no documented environmental health effects on humans associated with exposure to vinyl chloride monomer outside of the work place.

Health effects of VCM in occupational situations are described on pages 43-50 of reference 1. More detailed discussions of VCM-PVC appear in "Toxicity of Vinyl Chloride -Polyvinyl Chloride", reference 5.

The prime concern with respect to environmental exposure to VCM is its carcinogenicity. At concentrations of VCM greater than 50 ppm in inhaled air, test animals have developed angiosarcomas (malignancies) of the liver, in addition to other neoplastic (benign or malignant) disorders.

Carcinogenic effects of vinyl chloride appear to follow dose-response relationships at the lower experimental exposure levels (50 to 500 ppm), but there are no dose-response data for levels of 1 ppm and lower which would be found in ambient air. Studies of the large numbers of test animals which are required to detect low incidences of disease at these concentrations are underway in Italy and elsewhere, but human epidemiological data relative to low level ambient exposure are unlikely to be available for several decades.

Health effects of PVC dust have not been studied thoroughly, either in occupational or environmental exposure settings. Fine PVC dust is emitted by resin manufacturers and secondary fabricators and might possibly present an inhalation problem by transporting the entrapped VCM residue directly into the lung. PVC dust apparently also acts as a respiratory irritant in its own right.

Environmental and Occupational Air Standards

The Ontario Occupational Health Standard for vinyl chloride monomer for TWA eight hour exposure is 10 ppm (by volume) or 28 mg/m^3. The current Ontario 24-hour average ambient air quality guideline is 0.1 ppm (280 ug/m^3), and the ½-hour average design guideline in 0.2 ppm (560 ug/m^3) at a point of impingement.

The corresponding U.S. Occupational Health Standard is 1 ppm (3 mg/m^3) TWA over 8 hours, not to exceed a ceiling value of 5 ppm. The proposed U.S. EPA emission standard for VCM specifies certain process parameters and limits

stack (or other point source) emissions to 10 ppm maximum (reference 6).

Germany has a TLV for vinyl chloride of "no permissible expose", while Sweden uses a TLV of 1ppm ($3mg/m^3$) as in the U.S.

The basis for all of these standards is human health effects: carcinogenicity and to some extent cardiovascular system effects (at higher concentrations).

Sampling and Analytical Methods

These methods are set forth on pages 31-37 and in Appendix II of reference 1. Recommended sampling procedure at present is to draw a known volume of air through an activated charcoal filled cartridge which removes the vinyl chloride gas. In the laboratory, the vinyl chloride is desorbed from the charcoal adsorbent by cold carbon disulphide. This process is >90% efficient. An aliquot of the vinyl chloride/ CS_2 solution is injected into a gas chromatograph for quantitation. The overall sensitivity of this sampling and analysis procedure is about 0.003 ppm (3ppb) in the original air sample.

Alternatively, samples of air to be analysed for vinyl chloride may be collected in aluminized Mylar mutli-layer plastic bags, either as grab samples, or as integrated samples by slowly pumping in air over several hours. Other types of plastic bags (including Tedlar) have been found to be unsuitable for low-level VCM measurements.

Control and Abatement

Control technology is discussed on pages 24-30 of reference 1. The most significant recent development is

vacuum steam stripping with closed cycle recovery of VCM from the PVC resin slurry. Other segments of the PVC production process can also be equipped with monomer recovery plumbing, which combined with good preventive maintenance (of pump seals, etc.) can greatly reduce fugitive emissions.

TDA is to issue a report on VCM control technology in 1976.

REFERENCES FOR VINYL CHLORIDE SUMMARY

1. "Vinyl Chloride as an Airborne Hazardous Contaminant", ARB-TDA-01-74.

2. "Survey of Vinyl Chloride Monomer Concentrations in Ambient Air Near the Esso Chemical Polyvinyl Chloride and Dow Chemical VCM Plants in Sarnia, Ontario during Sept., Oct. and November 1974," ARB-TDA-02-75.

3. "Report on Ambient Air Quality Survey of B.F. Goodrich Chemical of Canada Ltd., Niagara Falls, May 6-May 15, 1975", ARB-TDA-09-75.

4. "Report on Ambient Air Quality Survey of Selected Fabricators of Polyvinyl Chloride Resin Products, June 24-Sept. 30, 1975." ARB-TDA-11-75.

5. "Toxicity of Vinyl Chloride-Polyvinyl Chloride", Annals of the New York Academy of Sciences, Vol. 246, pages 1-337, 1975.

6. "Proposed Standard for Vinyl Chloride", U.S. Environmental Protection Agency, U.S. Federal Register, vol. 40, No. 248, pages 59532-59552, December 24, 1975.

05.05 Hazardous Substances Data Sheets

05.05.01 REFERENCES FOR DATA SHEETS

GENERAL:

(1) "Data Base Compilation for Ontario Ministry of the Environment Hazardous Airborne Substances Study," James F. MacLaren Limited, February, 1976.

(2) "Hazardous Polluting Substances in the Lower Great Lakes," A report to Environment Canada, James F. MacLaren Limited, March, 1974.

(3) A.W. Gnyp et al., An Information Search and Evaluation of Properties, Potential Sources, Levels of Atmospheric Emissions and Environmental Effects of Exotic Air Pollutants, The Industrial Research Institute of the University of Windsor, September, 1973.

I PROPERTIES:

(4) G.G. Hawley (Revis.), The Condensed Chemical Dictionary, 8th ed., Van Nostrand Reinhold Company, New York, N.Y., 1971.

(5) R.C. Weast (ed.), Handbook of Chemistry and Physics, 51 st ed., Chemical Rubber Company, Cleveland, Ohio, 1970.

(6) P.G. Stecher (ed.), The Merck Index, 8th ed., Merck and Company Incorporated, Rahway, New Jersey, 1968.

(7) D.M. Considine, Chemical and Process Technology Encyclopedia, McGraw Hill Incorporated, 1974.

II HEALTH EFFECTS:

(8) N.I. Sax, Dangerous Properties of Industrial Materials, 4th ed., Van Nostrand Reinhold Company, New York, N.Y., 1975.

(9) Documentation of the Threshold Limit Values for Substances in Workroom Air, 3rd ed., American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio, 1971.

(10) M.N. Gleason et al., Clinical Toxicology of Commercial Products, Acute Poisoning, 3rd ed., The Williams and Wilkins Company, Baltimore, Maryland, 1969.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

(11) "Threshold Limit Values for Chemical Substances in Workroom Air Adopted by ACGIH for 1974," American Conference of Governmental Industrial Hygienists, 1974.

(12) Registry of Toxic Effects of Chemical Substances, 1975 ed., U.S. Department Of Health, Education, and Welfare, National Institute for Occupational Safety and Health, Rockville, Maryland, June, 1975.

(13) Work Hazard: Threshold Limit Values for Chemical Agents in the Workplace, International Occupational Health Conference, 1975.

(14) The Environmental Protection Act, 1971, Regulation 15, Ontario Regulation 872/74, Schedule 1 and the Ambient Air Quality Criteria Schedule, December, 1974.

IV COMMENTS:

(15) Reference 2.

(16) Kirk-Othmer Encyclopedia of Chemical Technology, 2nd ed.. John Wiley and Sons Inc., New York, N.Y., 1968.

(17) Reference 7.

TOXIC HAZARD RATING CODE *

The following system of toxicity ratings is used to indicate the relative hazard:

U = Unknown

This rating has been assigned to chemicals for which insufficient toxicity data were available to enable a valid assessment of hazard to be made. These compounds usually are in one of the following categories.

(a) No toxicity information could be found in the literature and none was known to the authors.

(b) Limited information based on animal experiments was available but in the opinion of the authors this information could not be applied to human exposures. In some cases this information is mentioned so that the reader may know that some experimental work has been done.

(c) Published toxicity data were felt by the authors to be of questionable validity.

0 = No Toxicity

This designation is given to materials which fall into one of the following categories:

(a) Materials which cause no harm under any conditions of normal use.

(b) Materials which produce toxic effects on humans only under the most unusual conditions or by overwhelming dosage.

1 = Slight Toxicity

(a) *Acute local.* Materials which on single exposures lasting seconds, minutes, or hours cause only slight effects on the skin or mucous membranes regardless of the extent of the exposure.

(b) *Acute systemic.* Materials which can be absorbed into the body by inhalation, ingestion, or through the skin and which produce only slight effects following single exposures lasting seconds, minutes, or hours, or following ingestion of a single dose, regardless of the quantity absorbed or the extent of exposure.

(c) *Chronic local.* Materials which on continuous or repeated exposures extending over periods of days, months, or years cause only slight and usually reversible harm to the skin or mucous membranes. The extent of exposure may be great or small.

(d) *Chronic systemic.* Materials which can be absorbed into the body by inhalation, ingestion, or through the skin and which produce only slightly usually reversible effects following continuous or repeated exposures extending over days, months, or years. The extent of the exposure may be great or small.

In general, those substances classified as having "slight toxicity" produce changes in the human body which are readily reversible and which will disappear following termination of exposure, either with or without medical treatment.

2 = Moderate Toxicity

(a) *Acute local.* Materials which on single exposure lasting seconds, minutes, or hours cause moderate effects on the skin or mucous membranes. These effects may be the result of intense exposure for a matter of seconds or moderate exposure for a matter of hours.

(b) *Acute systemic.* Materials which can be absorbed into the body by inhalation, ingestion, or through the skin and which produce moderate effects following single exposures lasting seconds, minutes, or hours, or following ingestion of a single dose.

(c) *Chronic local.* Materials which on continuous or repeated exposures extending over periods of days, months, or years cause moderate harm to the skin or mucous membranes.

(d) *Chronic systemic.* Materials which can be absorbed into the body by inhalation, ingestion, or through the skin and which produce moderate effects following continuous or repeated exposures extending over periods of days, months, or years.

Those substances classified as having "moderate toxicity" may produce irreversible as well as reversible changes in the human body. These changes are not of such severity as to threaten life or produce serious physical impairment.

3 = Severe Toxicity

(a) *Acute local.* Materials which on single exposure lasting seconds or minutes cause injury to skin or mucous membranes of sufficient severity to threaten life or to cause permanent physical impairment or disfigurement.

(b) *Acute systemic.* Materials which can be absorbed into the body by inhalation, ingestion, or through the skin and which can cause injury of sufficient severity to threaten life following a single exposure lasting seconds, minutes, or hours, or following ingestion of a single dose.

(c) *Chronic local.* Materials which on continuous or repeated exposures extending over periods of days, months, or years can cause injury to skin or mucous membranes of sufficient severity to threaten life or cause permanent impairment, disfigurement, or irreversible change.

(d) *Chronic systemic.* Materials which can be absorbed into the body by inhalation, ingestion or through the skin and which can cause death or serious physical impairment following continuous or repeated exposures to small amounts extending over periods of days, months, or years.

* N.I. Sax, Dangerous Properties of Industrial Materials, 4th ed., Van Nostrand Reinhold Company, New York, N.Y., 1975, Chapter 9.

ACETALDEHYDE

I PROPERTIES

Physical State (ambient temp.) - G

Vapour Pressure ($25^{0}C$) -

Chemical Formula - CH_3CHO

Molecular Weight - 44.1

Boiling Point - 20.8 C

Melting Point - -123.5 C

Solubility in Water - Soluble

Additional Information -

- Synonyms: Acetic Aldehyde, Ethyl Aldehyde, Ethanal
- Colourless fuming liquid at 20 C
- Pungent fruity odour

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	3	3
Acute Systemic -	2	
Chronic Local -		1
Chronic Systemic -	2	

Additional Information -

- A local irritant. Potential injury to respiratory tract. Effects are narcosis, bronchitis, albuminuria, fatty liver and lung edema.
- Inhalation does not cause chronic poisoning. But large doses may cause death by respiratory paralysis.
- Less irritating but stronger central nervous system depressant than formaldehyde.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 100 ppm; 180,000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	200	360,000
Sweden	50	90,000

D. Additional Information:

- U.S. TLV of 100 ppm is adopted to prevent excessive eye irritation and potential injury to the respiratory tract
- Soviet TLV (1966) 3 ppm
- U.S. Occupational Standard: time weighted average 200 ppm

IV COMMENTS

- Generally used in organic chemical industry as an intermediate for other products.

ACETIC ACID (GLACIAL)

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure ($25^{o}C$) -	15.4 mm Hg
Chemical Formula -	CH_3COOH
Molecular Weight -	60.1
Boiling Point -	118.1 C
Melting Point -	16.7 C
Solubility in Water -	Miscible in all proportions in water.

Additional Information -

- Synonyms: Ethanoic Acid, Vinegar Acid, Methane Carboxylic Acid
- Clear, colourless liquid
- Pungent odor
- Glacial acetic acid is the pure compound (99.8% min) as distinguished from the usual water solutions known as acetic acid (e.g., vinegar)

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	2	3
Acute Systemic -		
Chronic Local -		2
Chronic Systemic -		

Additional Information -

- Caustic, irritating to tissue
- Breathing of concentrated vapours is harmful to lung tissue. Harmless in dilute solutions as in vinegar.
- Can cause severe skin burns, dermatitis, and skin ulcers
- Damages the eyes, possibly causing total blindness in concentrated solution.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 2500 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 10 ppm; 25000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	10	25000
Sweden	10	25000

D. Additional Information:

- The Soviet TLV (1966) was 2 ppm
- U.S. TLV of 10 ppm is recommended to prevent undue irritation

IV COMMENTS

- Used in manufacture of plastics and resins, textiles, and leather, pharmaceuticals, pigments, photographic chemicals.
  Also used as food additive.

ACETONITRILE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25°C) -	88.3 mm Hg
Chemical Formula -	CH_3CN
Molecular Weight -	41.1
Boiling Point -	80.1 C
Melting Point -	- 41 C
Solubility in Water -	Very Soluble

Additional Information -

- Synonyms: Methyl Cyanide, Ethanenitrile
- Colourless, limpid liquid. Strongly reactive.
- Aromatic odor.
- Also soluble in alcohol
- Acetonitrile emits highly toxic fumes of cyanides when heated to decomposition.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		1
Acute Systemic -	3	
Chronic Local -		2
Chronic Systemic -	1	

Additional Information -

- Somewhat less toxic than hydrogen cyanide.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 40 ppm; 70000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	40	70000
Sweden		

D. Additional Information:

- A TLV of 40 ppm is recommended to protect against organic cyanide poisoning and injury to respiratory tract.

IV COMMENTS

- Used in manufacture of pharmaceuticals and medicines.
- Used as a solvent in hydrocarbon extraction processes especially for butadiene.

2 - ACETYLAMINOFLUORENE

I PROPERTIES

Physical State (ambient temp.) - S

Vapour Pressure (25^oC) -

Chemical Formula - $CH_3CONH\ (\overline{C_6H_4CH_2C}_6H_4)$

Molecular Weight - 224

Boiling Point -

Melting Point - 194C

Solubility in Water - insoluble

Additional Information -

- synonyms: 2-Acetaminofluorene, Acetyl Amino Phenathrene, N-fluoren-2-ylacetamide, 2-acetamidofluorene, N-acetyl-2-aminofluorene
- crystalline powder
- soluble in alcohol

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- highly toxic. A demonstrated (experimental) carcinogen
- recognized as a carcinogen by OSHA (U.S.), and Sweden
- Contact by all routes should be avoided

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- U.S. Occupational Standard: Carcinogen

IV. INDUSTRIAL SECTORS AND POTENTIAL SOURCES:

- An insecticide.

ACRYLAMIDE

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^oC) -	0.1 mm Hg
Chemical Formula -	$CH_2CHCONH_2$
Molecular Weight -	71.08
Boiling Point -	125 C
Melting Point -	84.5 C
Solubility in Water -	Soluble

Additional Information -

- White, crystalline, odorless solid
- Also soluble in alcohol and acetone. Insoluble in benzene.
- Emits acid fumes when heated.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	3	3
Acute Systemic -	2	
Chronic Local -		2
Chronic Systemic -	2	

Additional Information -

- Highly toxic by ingestion and inhalation. Strong skin and eye irritant. Can be absorbed through unbroken skin.
- Produces toxic effect upon central nervous system. Signs of poisoning include general muscular weakness, ataxia, and tremors. In mild cases, toxic effects are quickly reversible if exposure is terminated.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - Tentative Design Standard: 45 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 300 ug/m^3
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

IV COMMENTS

- Used as a reactive monomer and intermediate in production of organic chemicals.
- Used as polymer or copolymer in adhesives, fibers, plastics, and resins.
- Used in manufacture of paint and varnish, pigments and dyes.
- Used in waste water treatment, and in the textile and leather industries.

ACRYLONITRILE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25°C) -	107 mm Hg
Chemical Formula -	CH_2CHCN
Molecular Weight -	53.1
Boiling Point -	77.3 C
Melting Point -	-82 C
Solubility in Water -	Partially miscible

Additional Information -

- Synonyms: Propene Nitrile, Vinyl Cyanide
- Colourless, mobile liquid
- Mild odor
- Soluble in all common organic solvents

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		1
Acute Systemic -	3	
Chronic Local -		2
Chronic Systemic -	1	

Additional Information -

- Toxic by inhalation, ingestion, skin absorption.
- Symptoms similar to hydrogen cyanide poisoning (HCN) except less severe. Symptoms include headache, nausea, vomiting, and diarrhea. Also causes irritation of eyes, nose, and respiratory tract. Symptoms disappear after acute vapor exposure is terminated.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - Tentative Design Standard: 2200 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 20 ppm; 45,000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany (skin)	20	45,000
Sweden		

D. Additional Information:

- a TLV of 20 ppm is recommended on the basis of animal exposure data, and by analogy with the 10 ppm value for hydrogen cyanide.

IV COMMENTS

- Used as an intermediate in manufacture of acrylic fibers, acetonitrile - based plastics, nitrile rubber, insecticides, and other products of organic synthesis.

4- AMINOBIPHENYL

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^oC) -	
Chemical Formula -	$C_6H_5C_6H_4NH_2$
Molecular Weight -	169.2
Boiling Point -	302C
Melting Point -	53C
Solubility in Water -	slightly soluble

Additional Information -

- synonyms: p - aminodiphenyl, p-biphenylamine, xenylamine, p-phenylaniline, 4-aminodiphenyl
- colorless crystals
- soluble in alcohol, chloroform

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	1	1
Acute Systemic -	3	
Chronic Local -		1
Chronic Systemic -	3	

Additional Information -

- effects resemble those of Benzidine. Highly toxic by ingestion inhalation, skin absorption
- has caused bladder cancer in humans and experimental animals
- recognized as a carcinogen by OSHA (U.S.), Germany, Sweden
- contact by all routes of exposure should be avoided.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- U.S. Occupational Standard: Carcinogen

IV COMMENTS

- Used in the detection of sulfates.

AMMONIA

I PROPERTIES

Physical State (ambient temp.) -	G
Vapour Pressure ($25^{o}C$) -	7400 mm Hg
Chemical Formula -	NH_3
Molecular Weight -	17.0
Boiling Point -	- 33.4 C
Melting Point -	- 77.7 C
Solubility in Water -	Very Soluble

Additional Information -

- Colourless, alkaline gas
- Sharp, intensely irritating, pungent odor
- Also soluble in alcohols and organic solvents

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	3	3
Acute Systemic -		
Chronic Local -		1
Chronic Systemic -		

Additional Information -

- Irritant, primarily to eyes, nasal passages, throat, Becomes very corrosive in aqueous solution, as occurs when contact is made with respiratory mucous membranes. Can cause pulmonary edema.
- Irritation of skin, especially if it is moist
- Permanent damage to eyes, throat, and upper respiratory tract at 400-700 ppm
- Acts as an asphyxiant at high concentrations (greater than 2500 ppm)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 3600 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 25 ppm; 18000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	50	35000
Sweden	25	18000

D. Additional Information:

- U.S. Occupational Standard : 50 ppm (time weighted average)
- TLV of 25 ppm selected to protect against irritation to eyes and the respiratory tract
- Soviet TLV (1967) 15 ppm
- Czechoslovakia TLV (1969) 30 ppm

IV COMMENTS

Pulp and paper, fertilizers, petroleum refining, water treatment industrial gases, chlor-alkali process, iron and steel industry, cleaning (household and industrial), explosives, food and beverage industry, pulp and paper, textiles (rayon and nylon), rubber.

AMMONIUM CHLORIDE

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^{o}C) -	1 mm Hg at 160.4 C
Chemical Formula -	NH_4Cl
Molecular Weight -	53.5
Boiling Point -	520 C
Melting Point -	
Solubility in Water -	Soluble, up to 27.1 g in 100 g H_2O

Additional Information -

- Synonym: Sal Ammoniac
- White crystals
- Slightly soluble in alcohol
- Sublimes at 340 C

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	1	1
Acute Systemic -		
Chronic Local -		1
Chronic Systemic -		

Additional Information -

- Fume is toxic by inhalation. Large doses cause nausea, vomiting.
- In lower concentrations, it is a mild irritant to skin and respiratory passages.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 10,000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- TLV of 10 mg/m^3 selected to present irriation of the respiratory passages.

IV COMMENTS

- Battery manufacturing, rubber, plating, pharmaceuticals and medicine, plastics and synthetic resins, fertilizers.
- Large amounts of ammonium chloride fume are frequently evolved in galvanizing operations.

ANILINE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^{o}C) -	1 mm at 34.8 C
Chemical Formula -	$C_6H_5NH_2$
Molecular Weight -	93.12
Boiling Point -	184.4 C
Melting Point -	- 6.2 C
Solubility in Water -	Soluble

Additional Information -

- Synonyms: Aminobenzene, Phenylamine, Aniline Oil, Aminophen
- colorless, oily liquid; rapidly becomes brown on exposure to light and air
- characteristic odor and burning taste
- soluble in alcohol and most organic solvents. Volatile with steam.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -	3	

Additional Information -

- highly toxic by ingestion, inhalation, and skin absorption
- aniline acts on the hemoglobin of the blood to reduce its oxygen-carrying capacity
- it acts as a depressant of the central nervous system
- long-term exposures affect the blood, and possibly the liver and bladder
- it is an allergen and mild sensitizer. Local contact may cause dermatitis
- aniline has not been proven to be a carcinogen. But the intermediates, benzedine and naphthylamine, have been incriminated.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 5 ppm; 19000 ug/m^3
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany (skin)	5	19000
Sweden (skin)	5	19000

D. Additional Information:

- U.S. TLV of 5 ppm is adopted to prevent effects on hemoglobin (formation of methemoglobin)
- Soviet TLV (1966) 1 ppm
- Czechoslovakia TLV (1969) 1.3 ppm

IV COMMENTS

- Aniline is one of the most important of the organic bases. Used as parent substance for many dyes and drugs
- widely used in industry as an intermediate in chemical synthesis
- used in vulcanizing rubber

ANTIMONY AND ANTIMONY COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P.	B.P. C	M.P. C	Sol In H_2O
Antimony	Sb	121.75	S		1635	630.5	
Potassium Tartrate	$KSbC_4H_4O_7 \cdot 1/2\ H_2O$	333.94	S				
Trichloride	$SbCl_3$	228.11	S		283	73.4	V. SOL
Trioxide	Sb_2O_3 or Sb_4O_6	291.50	S		1550	656	SL.SOL
Stibine	SbH_3	124.8	G		-17	-88	SL.SOL

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	irritant
Acute Local -		
Acute Systemic -	3	
Chronic Local -		2
Chronic Systemic -	3	

Additional Information -

- recognized as a skin irritant. Sb dust causes eczema and dermatitis, Irritative to eyes
- inhalation of Sb compounds causes inflammation of respiratory tract (pneumonitis, laryngitis, tracheitis). Also causes perforation of nasal septum
- Medicinal treatment of antimony potassium tartrate may cause cardiac disturbances and injury
- animal experiments show cardiac injury
- gaseous stibine (SbH_3), like arsine, is highly toxic by inhalation.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

all forms: 75 ug/m^3 (as Sb)

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (Over 8 Hours) - Sb and compounds: 500 ug/m^3 (as Sb)
Stibine (SbH_3): 0.1 ppm; 500 ug/m^3

C. Occupational Standards (TLV) Elsewhere:

		(ppm)	(ug/m^3)
West Germany	Sb and Compounds:	—	500 (as Sb)
	Stibine (SbH_3):	0.1	500
Sweden	Sb and Compounds:	—	500 (as Sb)
	Stibine:	0.05	250

D. Additional Information:

Antimony and Compounds

- U.S. TLV OF 500 ug/m^3 is adopted on basis of human response

Stibine

- U.S. TLV of 0.1 ppm is adopted on basis of analogy with Arsine

IV COMMENTS

- Used in various alloys
- Used in following industries: glass and ceramics, rubber, paints and abrasives, semiconductor electronics.

ARSENIC AND ARSENIC COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P. mm Hg.	B.P. C	M.P. C	Sol In H_2O
Arsenic	As	74.92	S			Subl.613	INSOL.
Trioxide	As_2O_3 or As_4O_6	197.84	S	0.06		315	SOL.
Trisulphide	As_2S_3	246.04	S				SL. SOL.
Arsine	AsH_3	77.93	G		-55	-113.5	SL. SOL.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -	3	
Chronic Local -		2
Chronic Systemic -	3	

Additional Information -

- inhalation of As dust causes bronchitis, irritation of upper respiratory tract, and perforation of nasal septum
- cutaneous absorption of airborne As. compounds causes skin irritation and dermatitis
- chronic exposure (inhalation, ingestion) causes disturbances of digestive system, blood, and nervous system, liver and kidney damage, pigmentation and ulceration of skin
- a recognized carcinogen (officially in Germany and Sweden) of skin, lungs, and liver. An experimental (animal) carcinogen.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -	Arsenic:	15 ug/m^3
	Arsine	10 ug/m^3
Average Concentration over 24 hours -	Arsenic:	5 ug/m^3

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -	Arsenic, inorganic compds.		250 ug/m^3 (as As)
(Over 8 Hours) -	Arsine:	0.05ppm;	200 ug/m^3

C. Occupational Standards (TLV) Elsewhere:

		ppm	Ug/m^3
West Germany	Arsine:	0.05	200
Sweden	Arsenic and Compounds	–	500
	Arsine:	0.01	50

D. Additional Information:

Arsenic and Compounds

- Soviet TLV (1966) 300 ug/m^3
- Czechoslovakia TLV (1969) 300 ug/m^3
- U.S. Occupational Standard: time weighted average 500 ug/m^3

Arsine

- Soviet TLV (1966) 0.1 ppm
- Czechoslovakia TLV (1969) 0.06 ppm

IV COMMENTS

- major use of arsenic is in form of trioxide for pesticides and herbicides
- three major sources of arsenic air pollution are -
  - (i) smelting of metals (copper, lead, cobalt, gold)
  - (ii) burning of coal
  - (iii) use of arsenic compounds as pesticides
- arsine is generated in various operations (pickling of metals containing arsenic, soldering, etching, plating) which involve emission of hydrogen in presence of arsenic compounds.

ASPHALT

I PROPERTIES

Physical State (ambient temp.) - S

Vapour Pressure ($25^{o}C$) -

Chemical Formula - C_nH_n

Molecular Weight -

Boiling Point - < 470 C

Melting Point -

Solubility in Water - Insoluble

Additional Information -

- Synonyms: bitumen, petroleum pitch
- black or dark brown mass
- pitch-like odour
- soluble in petroleum, carbon disulphide, oil turpentine, acetone, and ether

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -		
Chronic Local -		2
Chronic Systemic -		

Additional Information -

- Specific health effects, particularly a carcinogenic potential, have not been definitely established.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (fumes) 5000 ug/m^3
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

IV COMMENTS

BARIUM AND BARIUM COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P.	B.P. C	M.P. C	Sol In H_2O
Barium	Ba	137.34	S		1140	725	
Acetate	$Ba(C_2H_3O_2)_2$	255.43	S				V.SOL.
Carbonate	$BaCO_3$	197.35	S				SOL.
Chloride	$BaCl_2$	208.25	S		1560	925	SOL.
Chromate	$BaCrO_4$	255.33	S				
2-Ethylhexoate							
Ferrite							
Hydroxide	$Ba(OH)_2 \cdot 8H_2O$	315.48	S			78	V.SOL.
Naphthenates							
Nitrate	$Ba(NO_3)_2$	261.35	S			592	SOL.
Nonyl Phenate							
Oxalate	BaC_2O_4	225.36	S			decomp. 400	SL.SOL
Stearate	$Ba(C_{18}H_{35}O_2)_2$	704.13	S				SL.SOL
Sulphate	$BaSO_4$	233.40	S		1580	1149	SL.SOL
Trinitrophloro-glucinate							

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	1	1
Acute Systemic -	3	
Chronic Local -		1
Chronic Systemic -	2	

Additional Information -
- inhaled barium compounds known to cause benign pneumoconiosis called "Baritosis"
- exposure to dusts of sulfide, oxide, and carbonate causes irritation of eyes, nose, throat, skin

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - soluble compounds: (as Ba) 500 ug/m^3
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany soluble compounds: (as Ba) 500 ug/m^3

Sweden

D. Additional Information:

BENZENE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^{o}C) -	72.5 mm Hg
Chemical Formula -	C_6H_6
Molecular Weight -	78.12
Boiling Point -	80.1 C
Melting Point -	5.5 C
Solubility in Water -	Slightly Soluble

Additional Information -

- Synonyms: Phenyl Hydride, Coal Naphtha
- Clear, colourless to light yellow liquid
- Aromatic odor
- Miscible with alcohol and most organic solvents

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	1	2
Acute Systemic -	2	
Chronic Local -	0	
Chronic Systemic -	3	

Additional Information -

- Primarily affects bone marrow resulting in numerous blood changes, and in serious cases, aplastic anemia and death. Some fatal cases diagnosed as leukemia
- Chronic poisoning can occur as a result of daily exposure to unsafe vapor concentrations over long period, or from a single concentrated exposure.
- Chronic exposure can occur through skin absorption.
- Officially recognized as a carcinogen in West Germany and Sweden
- Carcinogenic in some animal experiments

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 10000 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 10 ppm; 30000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany		
Sweden (skin)	10	30000

D. Additional Information:

- Soviet TLV (1967) 6 ppm
- Czechoslovakia TLV (1969) 16 ppm
- U.S. Occupational Standards:
  - Ceiling Value 25 ppm
  - Peak Value 50 ppm (10 min/8 hour)
- American National Standards Institute TLV (1969) 10 ppm

IV COMMENTS

- Used as basic raw material for manufacture of many aromatic organic materials in refineries. Also used in manufacture of paints and varnishes, including putty, fillers, stains, and finishes.

BENZIDINE

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^oC) -	
Chemical Formula -	$NH_2(C_6H_4)_2NH_2$
Molecular Weight -	184.23
Boiling Point -	400 C
Melting Point -	127 C
Solubility in Water -	Slightly Soluble
Additional Information -	

- Synonyms: Benzidine Base; p-Diaminodiphenyl; 4,4′ - Biphenyldiamine
- Gray-yellow crystalline powder. Darkens on exposure to light
- Soluble in alcohol and ether.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -	3	

Additional Information -

- Recognized as a human carcinogen by OSHA (U.S.), Germany, and Sweden
- extremely toxic by inhalation, ingestion, and skin absorption; any exposure is considered hazardous
- can cause blood and bone marrow damage. Also bladder tumors
- on ingestion, causes nausea and vomiting. May be followed by liver and kidney damage.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- U.S. Occupational Standard: Carcinogen

IV COMMENTS

- Used in the manufacture of various dyes
- used in organic synthesis and as a stiffening agent in rubber compounding
- an analytical agent

BERYLLIUM AND BERYLLIUM COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P.	B.P. C	M.P. C	Sol In H_2O
Beryllium	Be	9.013	S		2970	1278	INSOL.
Ceramics							
Aluminum Alloys							
Copper Alloys							
Oxide	BeO	25.01	S		3900	2530	INSOL.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	irritant
Acute Local -	3	3
Acute Systemic -	3	
Chronic Local -	3	1
Chronic Systemic -	3	

Additional Information -

- all common Be compounds are extremely toxic by inhalation even in very low concentrations. Beryllium disease is systemic
- Chronic: pneumonitis, lesions of lung, dermatitis, inflammation and enlargement of liver and spleen, cardiac failure, mild edema of brain, inflammation of eye. May be fatal.
- Acute: chemical pneumonitis with systemic effects
- regarded as a human carcinogen in Germany and Sweden
- experimental carcinogen of lungs and bones.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - all forms: (as Be) 0.03 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 2 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden 2 ug/m^3

D. Additional Information:

- Soviet TLV (1966) 1 ug/m^3
- American National Standards Institute TLV (1969) 2 ug/m^3
- U.S. Occupational Standard for Beryllium

Time Weighted Average	2 ug/m^3	
Ceiling Value	5 ug/m^3	
Peak Value	25 ug/m^3	(30 min/8 hours)

IV COMMENTS

- used as hardening agent in Be-Cu and other alloys
- used as structural material in aerospace industry
- used as moderator in nuclear reactors

CADMIUM AND CADMIUM COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P.	B.P. C	M.P. C	Sol In H_2O
Cadmium	Cd	112.4	S		767	320.9	INSOL.
Benzoate	$Cd(C_2H_3O_2)\cdot 2H_2O$	390.66		$<$ 1 mm			SOL.
Chloride	$CdCl_2$	183.32			960	568	V. SOL
Cyanide	$Cd\ (CN)_2$	164.44	S				SOL.
2-Ethylhexoate							
Nitrate	$Cd(NO_3)_2$	236.41	S		350		V.SOL.
Oxide	CdO	128.40				DECOMP. 900	INSOL.
Selenide	$CdSe$	191.36	S			$>$ 1350	INSOL.
Stearate							
Sulphate	$CdSO_4$	208.46	S			1000	V. SOL.
Sulphides	CdS	144.46			Subl. 980	1750*	SL.SOL.
Sulphoselenides							

* 100 atm. pressure

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	3	3
Acute Systemic -	3	
Chronic Local -	3	
Chronic Systemic -	3	

Additional Information -

- inhalation of Cd compounds, specifically metal fumes, oxide, and salts, causes pulmonary emphysema and bronchitis. Also damage to kidneys where accumulation of Cd takes place.
- in severe exposure, lung damage is fatal
- other effects are gastric and intestinal disorders and damage, liver damage and anemia
- implicated in cardiovascular disorders and hypertension
- Cd compounds are suspected carcinogens of connective tissue, lungs and liver. Cadmium is carcinogenic in some animal experiments.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

	all forms: (as Cd)
Point of Impingement (half-hour average) -	5.0 ug/m^3
Average Concentration over 24 hours -	2.0 ug/m^3

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -	Cd dusts and salts:	50 ug/m^3 (as Cd)
(Over 8 Hours) -	Cd oxide fume: (ceiling)	50 ug/m^3 (as Cd)

C. Occupational Standards (TLV) Elsewhere:

		(ug/m^3)
West Germany	Cd oxide fume: (ceiling)	100 (as Cd)
Sweden	Cd dusts and salts:	20 (as Cd)

D. Additional Information:

- U.S. TLV of 50 ug/m^3 adopted to prevent acute or chronic toxic effects of Cadmium fume inhalation
- Soviet (1967) and Czechoslovokia (1969) TLV 100 ug/m^3
- U.S. Occupational Standards
- Time Weighted Average: 200 ug/m^3 Ceiling Value: 600 ug/m3

CARBON BLACK

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^{o}C) -	
Chemical Formula -	C
Molecular Weight -	12.01
Boiling Point -	
Melting Point -	
Solubility in Water -	Insoluble

Additional Information -
- Amorphous powder
- Sublimes at 3652 C

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	1	
Acute Systemic -	0	
Chronic Local -	3	3
Chronic Systemic -		

Additional Information -

- has caused cancer in the nasal sinuses, lungs and skin, when oily material present (coal tar, etc.) Carcinogenic property may be due to some coal tar product which adheres to the soot (carbon black) rather than the soot itself.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 25 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 3500 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

IV COMMENTS

Rubber (tires), printing inks, paints, plastics and synthetic resins, textiles

CARBON DISULPHIDE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25°C) -	336 mm Hg
Chemical Formula -	CS_2
Molecular Weight -	76.1
Boiling Point -	46.5 C
Melting Point -	-110.8 C
Solubility in Water -	Soluble

Additional Information -

- clear, colorless liquid. Almost odorless when pure

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		1
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -	3	

Additional Information -

- Toxic by inhalation, ingestion, and skin absorption
- Chief effect on central nervous system, acting as a rarcotic and anesthetic
- death from respiratory failure in acute poisoning

CARBON DISULPHIDE (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 330 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 20 ppm; 60000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany		
Sweden (skin)	10	30000

D. Additional Information:

- U.S. Occupational Standard: Ceiling Value 30 ppm
- Soviet TLV (1967) 4 ppm
- Czechoslovakia TLV (1969) 10 ppm
- American National Standards Institute TLV (1968) 20 ppm
- U.S. Occupational Standard:
  Peak Value: 100 ppm (30 min/8 hours)

IV COMMENTS

- Used in manufacture of plastics and synthetic resins.

CARBON TETRACHLORIDE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure ($25^{0}C$) -	114.5 mm Hg
Chemical Formula -	$C\ Cl_4$
Molecular Weight -	153.8
Boiling Point -	76.8 C
Melting Point -	-22.6 C
Solubility in Water -	Insoluble

Additional Information -

- Synonym: Tetrachloromethane
- Colorless liquid. Characteristic, non-irritating odor. Odor threshold 10 ppm
- Miscible with alcohol, many common organic solvents, and most of fixed and volatile oils
- decomposes to phosgene at high temperatures.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	0	
Acute Systemic -	3	
Chronic Local -		1
Chronic Systemic -	3	

Additional Information -

- Irritant to mucous membranes. Depresses central nervous system
- Exposures to high concentrations may result in death from respiratory failure.
- Long term exposure to low concentrations (also after-effects of severe non-fatal exposures) results in damage to kidneys, liver and lungs.
- vapour is irritating to eyes
- contact with liquid causes dermatitis
- a suspected carcinogen. Found to be carcinogenic in some animal experiments

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - $20000\ ug/m^3$

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 10 ppm; $65000\ ug/m^3$

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany (skin)	10	65000
Sweden(skin)	10	65000

D. Additional Information:

- Soviet TLV (1966) 3 ppm
- Czechoslovakia TLV (1969) 8 ppm
- American National Standards Institute TLV (1957) 10 ppm
- U.S. Occupational Standards

Ceiling Value	25 ppm	
Peak Value	200 ppm	200 ppm (5 min/8 hour)

IV COMMENTS

- Used in production of refrigerants and propellants (chlorofluorohydrocarbons)
- metal degreasing, agricultural fumigant, chlorinating organic compounds.

CHLORINE

I PROPERTIES

Physical State (ambient temp.) -	G
Vapour Pressure (25^{o}C) -	7.86 atms.
Chemical Formula -	Cl_2
Molecular Weight -	70.9
Boiling Point -	-34.5 C
Melting Point -	-101 C
Solubility in Water -	Soluble

Additional Information -

- Greenish-yellow gas. Pungent, irritating, suffocating odor. Odor threshold less than 1 ppm
- Vapor density 3.214 gm/litre (at OC and 1 atms)
- Extremely reactive. Strong oxidizing and bleaching properties
- In presence of moisture, chlorine forms hypochlorite which is a strong oxidant. Wet chlorine is extremely corrosive to the common metals.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	3	3
Acute Systemic -	0	
Chronic Local -		
Chronic Systemic -		

Additional Information -

- At low concentrations (1 ppm), main effect is irritation of eyes, nose, throat, and respiratory tract.
- Inhalation of large doses can damage lung tissue, and produce pulmonary edema, pneumonitis, emphysema, or bronchitis.
- In extreme cases, death may occur by suffocation.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - $300\ ug/m^3$

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 1 ppm; $3000\ ug/m^3$

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	0.6	1500
Sweden	1	3000

D. Additional Information:

-TLV of 1 ppm is adopted to minimize chronic changes in lungs
-Soviet TLV (1966) 0.3 ppm
-Czechoslovakia TLV (1969) 1 ppm

IV COMMENTS

- Used in production of organic and inorganic chemicals
- Used to bleach pulp for paper and rayon manufacture
- Used in treatment of water and wastewater
- Used in production of pesticides, herbicides, refrigerants, plastics, propellants, soap and cleaning compounds, pigments, industrial gases, textiles.
- Used in chlor-alkali processes and petroleum refining.

CHLORINE DIOXIDE

I PROPERTIES

Physical State (ambient temp.) -	G
Vapour Pressure (25^{o}C) -	831 mm Hg @ 11 C
Chemical Formula -	$Cl\ O_2$
Molecular Weight -	67.45
Boiling Point -	9.9 C
Melting Point -	-59.5 C
Solubility in Water -	Soluble

Additional Information -
- Red yellow gas
- very reactive and strong oxidizing agent
- dissolves in alkalies forming a mixture of chlorite and chlorate
- decomposes when heated, emitting toxic fumes of chlorine
- reacts with water or steam to form fumes of hydrochloric acid

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	3	3
Acute Systemic -		
Chronic Local -		3
Chronic Systemic -		

Additional Information -

- severe irritant to eyes and respiratory tract
- may cause pulmonary edema
- can be fatal at high concentrations (20 ppm)
- can cause bronchitis and emphysema following prolonged exposure to low concentrations.

CHLORINE DIOXIDE (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 85 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 0.1 ppm; 300 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	0.1	300
Sweden	0.1	300

D. Additional Information:

- TLV OF 0.1 ppm is adopted to prevent irritation and possible bronchitis.

IV COMMENTS

- Used in water and waste water treatment
- Used as a bleaching agent for wood, pulp, fats, oils and flour
- Used in manufacture of sulfur and sulfuric acid

CHLOROBENZENE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^oC) -	11.7 mm Hg
Chemical Formula -	C_6H_5Cl
Molecular Weight -	112.6
Boiling Point -	131.7 C
Melting Point -	-45 C
Solubility in Water -	Insoluble

Additional Information -

- Synonym: Monochlorobenzene, Chlorobenzol, Phenyl Chloride
- Clear, colorless volatile liquid
- Almond-like odor
- Miscible with most organic solvents

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	1	1
Acute Systemic -	2	
Chronic Local -	0	
Chronic Systemic -	2	

Additional Information -

- Strong narcotic. Possesses only slight irritant qualities.
- Generally not as toxic as phenol
- Animal studies reveal lung, liver and kidney damage following repeated exposures at high concentrations.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 75 ppm; 350000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	50	230000
Sweden		

D. Additional Information:

- TLV (U.S.) of 75 ppm adopted to prevent narcotic effects or chronic poisoning
- Soviet TLV (1966) 10 ppm
- Czechslovakia TLV (1969) 43 ppm

IV COMMENTS

- Used in petroleum refining, paint and varnish manufacture
- Used in production of pesticides
- Used in production of various organic solvents

CHLOROFORM

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25°C) -	172 mm Hg
Chemical Formula -	$CHCl_3$
Molecular Weight -	119.4
Boiling Point -	61.3 C
Melting Point -	- 63.5 C
Solubility in Water -	Slightly Soluble

Additional Information -

- Synonym: Trichloromethane
- Clear, colorless, volatile liquid
- Heavy etheral odor; sweet taste
- Miscible with alcohol, organic solvents, and fixed and volatile oils

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		1
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -		

Additional Information -

- Main effect is depression of the central nervous system (more potent than $C\,Cl_4$)
- Prolonged inhalation will cause death from cardiac and respiratory failure
- Its wide use as an anesthetic has been abandoned due to its damaging effects on the liver, heart and kidney
- Causes irritation of the eyes and mucous membranes of the respiratory tract.
- A suspected carcinogen. Found to be carcinogenic in some animal experiments.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 25 ppm; 120000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	50	240000
Sweden	25	125000

D. Additional Information:

- TLV (U.S.) of 25 ppm is adopted to prevent any serious short-term effects on the liver
- Czechoslovakia TLV (1969) 10 ppm
- American National Standards Institute TLV (1957) 10 ppm

IV COMMENTS

- Used in manufacture of fluorocarbon refrigerants and propellants, fluorocarbon plastics, dyes, and pigments, insecticides, pharmaceuticals
- Used in petroleum refining

bis - CHLOROMETHYL ETHER

I PROPERTIES

Physical State (ambient temp.) - L

Vapour Pressure (25°C) -

Chemical Formula - $O(CH_2Cl)_2$

Molecular Weight - 115

Boiling Point - 105

Melting Point -

Solubility in Water - INSOLUBLE

Additional Information -

- Synonyms: Dichlorinated methyl oxide; BCME, sym- dichloromethyl ether; Dimethyl -1,1 - Dichloroether
- Colorless, volatile liquid; suffocating odour
- Soluble in acetone, benzene, ethyl and methyl alcohol
- Highly reactive liquid with high vapor pressure

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	3	3
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- Strong irritant to eyes and respiratory tract
- regarded as a carcinogen by OSHA (U.S) and Sweden

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 0.001 ppm

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- U.S. Occupational Standard: Carcinogen

IV COMMENTS

- Used as intermediate in manufacture of resins
- bis-Chloromethyl Ether may form in air as a product of the reaction between Formaldehyde and Hydrogen Chloride

CHLOROPRENE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^oC) -	
Chemical Formula -	$CH_2CHCClCH_2$
Molecular Weight -	88.5
Boiling Point -	60 C
Melting Point -	
Solubility in Water -	Slightly Soluble

Additional Information -

- Synonyms: 2- chloro, 1,3 - butadiene, Chlorobutadiene
- colorless
- soluble in alcohol

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	2	2
Acute Systemic -	3	3
Chronic Local -		
Chronic Systemic -	3	

Additional Information -

- highly toxic by ingestion, inhalation, and skin absorption
- nervous system depressant
- dermatitis, eye injury and anemia have been reported in humans

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 25 ppm; 90000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	25	90000
Sweden	25	90000

D. Additional Information:

- subject of current OSHA carcinogenesis inquiry

IV COMMENTS

- used in manufacture of neoprene

CHROMIUM AND CHROMIUM COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P.	B.P. C	M.P. C	Sol In H_2O
Chromium	Cr	60.0	S		2200	1900	INSOL.
Chrome pigments	$PbCrO_4$ (red)	323.18	S			844	INSOL.
(Chromates)	Pb CrO_4.PbO (yellow)	546.37	S				INSOL
-ic Acid (oxide)	CrO_3	100.01	S			196	V. SOL.
Chromite	(FeO,Cr_2O_3)						
(II) Acetate	$Cr(C_2H_3O_2)_2$	170.09	S				SL.SOL.
(III) Acetate	$Cr(C_2H_3O_2)_3 \cdot H_2O$	247.15	S				SOLUBLE
Lignosulphonates							
(II) Sulphate	$CrSO_4 \cdot 7H_2O$	274.17	S				SOL.
(III) Sulphate	$Cr_2(SO_4)_3$	392.18	S			100	SOL
(III) Sulphate	$Cr_2(SO_4)_3 \cdot 15H_2O$	662.41	S				SOL.
(III) Sulphate	$Cr(SO_4)_3 \cdot 18H_2O$	716.45	S				V. SOL.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	3	3
Acute Systemic -		
Chronic Local -	3	3
Chronic Systemic -	3	

Additional Information -

- Hexavalent compounds more toxic than trivalent. Metal is non-toxic
- irritative and corrosive to body tissue
- inhalation causes perforation of nasal septum and respiratory disorders: chronic inflammation of lungs, pneumonia, laryngeal congestion, emphysema, tracheitis, chronic bronchitis, pharyngitis
- causes hypersensitivity with contact dermatitis. Causes skin ulceration
- Chromate salts are recognized carcinogens (U.S., Germany, Sweden) of lungs, nasal cavity, and paranasal sinus. Also experimental carcinogens of stomach and larynx.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

	all forms: (as Cr)
Point of Impingement (half-hour average) -	30 ug/m^3
Average Concentration over 24 hours -	

B. Ontario Occupational Health Guidelines: ug/m^3

Threshold Limit Value -	Chromic acid, chromates: 100 (as CrO_3) Sol. chromic, chromous salts: 500 (as Cr)
(Over 8 Hours) -	Insol. chromates - Pb, Zn, and chromate-chromite ore: 100 (as Cr) CARCINOGEN

C. Occupational Standards (TLV) Elsewhere:

West Germany	Chromic acid and chromates:	100 ug/m^3
Sweden	Chromic Acid and chromates:	50 ug/m^3

D. Additional Information:

For Chromic Acid and Chromates:

- Soviet TLV (1966) 10 ug/m^3
- Czechoslovakia TLV 100 ug/m^3
- American National Standards Institute TLV 100 ug/m^3

IV COMMENTS

COAL TAR PITCH

I PROPERTIES

Physical State (ambient temp.) -

Vapour Pressure (25^{o}C) -

Chemical Formula - Polynuclear aromatic compounds

Molecular Weight -

Boiling Point -

Melting Point -

Solubility in Water -

Additional Information -

- black-brown tar-like mass

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	1	1
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- highly toxic by inhalation
- recognized as a human carcinogen by the American Conference of Governmenta
  Industrial Hygienists (U.S.)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 200 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

IV COMMENTS

- binder for carbon electrodes
- base for paints and coatings
- paving and roofing
- sealants
- tar bonded refractory bricks
- plasticizer for elastomers and polymers

COBALT AND COBALT COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P. 25 C	B.P. C	M.P. C	Sol In H_2O
Cobalt	Co	58.9	S		3100	1943	insol.
Acetate	$Co(C_2H_3O_2)_3$	236.07	S			dec.100	insol.
Blue	$CoAl_2O_4$	176.89	S				insol.
Ethylhexoate							
Decanoates							
Linoleate	$Co(C_{18}H_{31}O_2)_2$	617.83	S				insol.
Naphthenates	indefinite	indefinite	S				
Soaps							
Tallate	Salt of tall oil mixture of rosin acids and fatty acids						
Tetracarbonyl	$Co_2(CO)_8$	342.0		1mm	decomp. 52^oC	51^oC	

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -	1	
Chronic Local -		
Chronic Systemic -		

Additional Information -
- inhalation may cause pulmonary symptoms
- powder may cause dermatitis
- a suspected carcinogen of connective tissue and lungs
- a recognised experimental (animal) carcinogen in Germany
- a recognised human carcinogen in Sweden

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (Over 8 Hours) -	metal dust:	10 ug/m^3

C. Occupational Standards (TLV) Elsewhere:

West Germany	metal dust:	500 ug/m^3
Sweden	metal dust:	100 ug/m^3

D. Additional Information:

IV COMMENTS

- about 75-80% used for metallurgical applications
- remainder taken up by chemical applications

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P.	B.P. C	M.P. C	Sol In H_2O
Copper	Cu	63.5	S		2595	1083	INSOL.
2-Ethylhexoate							
Naphthenate	$(C_6H_5COO)_2Cu$	221.9					INSOL.
Oleate	$Cu(C_{18}H_{33}O_2)_2$	626.47	S				INSOL.
(I) Oxide	Cu_2O	143.08	S		1800	1235	INSOL.
(II) Oxide	CuO	79.54	S			1326	INSOL.
β - Quinolinolate							
(I) Sulphate	Cu_2SO_4	223.14				200	Dissoci ation
(II) Sulphate	$CuSO_4$	159.60					SOL.
Tallate	Salt of tall oil mixture of rosin acids and fatty acids.						
Cupric							
Acetate	$Cu(C_2H_3O_2)_2.H_2O$	199.64	S		240	115	SOL.
Chloride	$CuCl_2$	134.48	S			498	SOL.
Citrate	$2Cu_2C_6H_4O_7$	315.18	S				SL.SOL
Dichromate	$CuCr_2O_7.2H_2O$	315.59	S				SOL.
Nitrate	$Cu(NO_3)_2$	187.56	S		Subl. 150-255	255	SOL.
Salicylate	$Cu(C_7H_5O_3)_2.4H_2O$	409.8	S				SOL.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	1	1
Acute Systemic -	2	
Chronic Local -		
Chronic Systemic -	1	

Additional Information -

- copper oxide (fume, dust) causes irritation of eyes and upper respiratory tract, nausea, metal fume fever
- dusts of copper salts cause perforation of nasal septum, skin irritation, and inflammation of eyes.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - all forms: 100 ug/m^3 (as Cu)

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - Copper Fume: 200 ug/m^3
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany	Copper dust:	1000 ug/m^3
	Copper Fume:	100 ug/m^3
Sweden		

D. Additional Information:

IV COMMENTS

CREOSOTE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure ($25^{o}C$) -	
Chemical Formula -	Mixture of phenols
Molecular Weight -	
Boiling Point -	203-220 C
Melting Point -	
Solubility in Water -	
Additional Information -	

- Synonyms: wood creosote, beachwood
- consists of phenanthrene, acenaphthene, fluorene, diphenylene oxide, anthracene, and carbazole
- clear - yellow oily liquid
- smoky odour

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	2	2
Acute Systemic -	2	
Chronic Local -		
Chronic Systemic -		

Additional Information -

- caustic substance
- large doses may cause damage to the intestinal and cardiovascular systems

CREOSOTE (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

IV COMMENTS

- wood preservative
- obtained from the distillation of wood tar

CRESOLS

I PROPERTIES

Physical State (ambient temp.) - L

Vapour Pressure (25^oC) - 1.06 mm Hg @ 38.2 C

Chemical Formula - $C_6H_4OHCH_3$

Molecular Weight - 108.1

Boiling Point - 191-203 C

Melting Point - 10.9 - 35.5 C

Solubility in Water - Slightly Soluble

Additional Information -

- Synonyms: Cresylic Acid, Cresylol, Tricresol Methyl Phenol
- Mixture of isomeric cresols (m,o,p forms) obtained from coal tar. Belongs to Phenol group of aromatic organic compounds
- Colorless, or yellow-brown, or pink liquid
- Phenol-like odor
- Soluble in alcohol

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	2	2
Acute Systemic -	2	
Chronic Local -		3
Chronic Systemic -	2	

Additional Information -

- effect similar to phenol, except less severe. A general protoplasmic poison
- corrosive action on skin and mucous membranes; causes dermatitis. Absorbed through skin.
- possibly damaging to kidneys, liver, and nervous system

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 230 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 5 ppm; 22000 ug/m^3
(Over 8 Hours) - (all isomers)

C. Occupational Standards (TLV) Elsewhere:

	ppm	ug/m^3
West Germany (skin)	5	22000
Sweden		

D. Additional Information:

- U.S. TLV of 5 ppm adopted to prevent irritation effects

IV COMMENTS

- manufacturing of synthetic resins, herbicides, various chemicals
- used as a disinfectant, and in textile and leather industry

CUMENE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^{o}C) -	4.5 mm Hg
Chemical Formula -	$C_6H_5CH(CH_3)_2$
Molecular Weight -	120.2
Boiling Point -	152 C
Melting Point -	- 96 C
Solubility in Water -	Insoluble

Additional Information -

- Synonyms: Isopropylbenzene, cumol, 2- phenylpropane
- colourless liquid
- soluble in alcohol

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		1
Acute Systemic -	3	
Chronic Local -		2
Chronic Systemic -	2	

Additional Information -

- depressant of the central nervous system
- highly toxic through skin absorption
- more toxic than benzene or toluene

CUMENE (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 50 ppm; 245000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

		(ppm)	(ug/m^3)
West Germany	(skin)	50	245000
Sweden			

D. Additional Information:

IV COMMENTS

- found in American petroleum
- used in production of phenol, acetone, and alpha-methylstyrene
- used as a solvent

CYANOGEN

I PROPERTIES

Physical State (ambient temp.) -	G
Vapour Pressure (25^oC) -	
Chemical Formula -	C_2N_2
Molecular Weight -	52.04
Boiling Point -	-21.0 C
Melting Point -	-34.4 C
Solubility in Water -	Soluble

Additional Information -

- Synonyms: Ethanedinitrile; Dicyan; Oxalonitrile; Oxalic Nitrile; Prussite
- Colorless gas; pungent, penetrating odor
- Soluble in alcohol and ether

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- Comparable to Hydrogen Cyanide in its toxic effects
- causes eye and nasal irritation

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 10 ppm

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	10	22000
Sweden		

D. Additional Information:

- U.S. TLV of 10 ppm is adopted by analogy with hydrogen cyanide, and to prevent irritation as well as systemic effects

IV COMMENTS

- used primarily in organic synthesis
- used as a fuel gas for welding and cutting heat-resistant metals
- used as rocket and missile propellant
- used as a fumigant

DIBUTYL PHTHALATE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^{o}C) -	1.03 mm Hg at 148.2 C
Chemical Formula -	$C_6H_4\ (COOC_4H_9)_2$
Molecular Weight -	278.3
Boiling Point -	340 C
Melting Point -	- 35 C
Solubility in Water -	Insoluble

Additional Information -
- Colorless, odorless, stable, oily liquid
- Miscible with common organic solvents
- Normal, meta, and ortho forms

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- Effect similar to that of Phthallic Anhydride
- May cause eye inflammation, chronic bronchitis and emphysema

DIBUTYL PHTHALATE (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -	5,000 ug/m^3
(Over 8 Hours) -	

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- TLV (U.S.) of 5000 ug/m^3 is adopted more from the standpoint of controlling excessive airborne mists of Dibutyl Phthalate rather than as a health measure.

IV COMMENTS

- Plastics and synthetic resins, paint and varnish, explosives, photographic materials, insecticide.

P-DICHLOROBENZENE

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^oC) -	1.08 mm Hg at 30 C
Chemical Formula -	$C_6H_4Cl_2$
Molecular Weight -	147.0
Boiling Point -	173.4
Melting Point -	53 C
Solubility in Water -	Insoluble

Additional Information -

- Synonym: 1,4 - Dichlorobenzene
- White crystals; sublimes easily
- Penetrating odor
- Soluble in benzene, alcohol, and ether
- Also in meta and ortho forms

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	1	1
Acute Systemic -		
Chronic Local -		2
Chronic Systemic -	1	

Additional Information -

- The P-isomer is less toxic than the O-form
- Irritating to skin, eyes, and throat
- Animal studies reveal liver and kidney damage
- Has been reported to cause liver injury in humans

P-DICHLOROBENZENE (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 75 ppm; 450000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	75	450000
Sweden		

D. Additional Information:

IV COMMENTS

- Used as an insecticide, fumigant, and in the manufacture of dyes and pharmaceuticals.

3,3′ DICHLOROBENZIDINE

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^oC) -	
Chemical Formula -	$C_6H_3ClNH_2C_6H_3ClNH_2$
Molecular Weight -	253.1
Boiling Point -	
Melting Point -	133 C
Solubility in Water -	Insoluble

Additional Information -

- Synonym: 3,3′ - dichloro - 4,4′ - diamino biphenyl
- crystalline solid; purple-to-gray
-soluble in alcohol, ether, benzene, and glacial acetic acid

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- recognized as a carcinogen by OSHA (U.S.), Germany and Sweden
- No exposure by any route should be permitted

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- U.S. Occupational Standard: Carcinogen

IV COMMENTS

- Used as an intermediate for dyes and pigments
- used as a curing agent for isocyanate-terminated and urethane resins

DIMETHYLAMINOAZOBENZENE

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^oC) -	
Chemical Formula -	$C_6H_5NNC_6H_4N(CH_3)_2$
Molecular Weight -	229.1
Boiling Point -	
Melting Point -	116
Solubility in Water -	Insoluble

Additional Information -

- synonym: Methyl Yellow
- Yellow crystalline solid
- Soluble in alcohol, ether, mineral acids, oils

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- Ingestion causes liver cancer in experimental animals
- recognized as a carcinogen by OSHA (U.S.)
- no exposure by any route should be permitted
- Carcinogenic in several animal experiments. Causes liver cancer on an acute basis in rats and mice.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- US Occupational Standard: Carcinogen

IV COMMENTS

- used as an indicator in volumetric analysis

DIMETHYL SULPHATE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^{o}C) -	
Chemical Formula -	$(CH_3)_2 SO_4$
Molecular Weight -	126.1
Boiling Point -	188 C
Melting Point -	-31.8 C
Solubility in Water -	Soluble

Additional Information -

- Synonym: methyl sulphate
- colourless, odourless liquid
- soluble in alcohol, ether, aromatic hydrocarbons
- odourless

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	3	3
Acute Systemic -	3	
Chronic Local -	3	3
Chronic Systemic -	3	

Additional Information -

- Recognized carcinogen by Germany, Sweden, and the American Conference of Governmental Industrial Hygienists (U.S.)
- extremely toxic through skin absorption
- 6-8 hour exposure may cause fatal kidney, liver, or lung damage
- short mild exposure may result in inflammation of the mucous membranes of the respiratory system

DIMETHYL SULPHATE (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany (skin)	.01	50
Sweden		

D. Additional Information:

IV COMMENTS

- Used as methylating agent for amines and phenols

ETHANOLAMINE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^oC) -	0.36 mm at 20 C
Chemical Formula -	$NH_2CH_2CH_2OH$
Molecular Weight -	61.1
Boiling Point -	170.5 C
Melting Point -	10.5 C
Solubility in Water -	Very Soluble

Additional Information -

- Synonym: Monoethanol Amine, 2-Aminoethanol
- Related compounds: Di-, and Tri-Ethanolamine
- Colorless, viscious liquid; Ammoniacal odor
- Soluble in organic solvents

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -	2	
Chronic Local -		
Chronic Systemic -		

Additional Information -

- Irritant and necrotic effect on skin
- Inhalation animal studies reveal it to be a central nervous system stimulant at low doses, and a central nervous system depressant at lethal doses.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 3 ppm; 6000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

IV COMMENTS

- Soap and cleaning compounds
- Used in scrubbing acid gases especially in synthesis of ammonia
- Manufacture of emulsion paints, polishes, and pharmaceuticals
- Used as a rubber accelerator

ETHYL BENZENE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^{o}C) -	9.76 mm Hg
Chemical Formula -	$C_6H_5C_2H_5$
Molecular Weight -	106.2
Boiling Point -	136.2 C
Melting Point -	- 95 C
Solubility in Water -	Insoluble

Additional Information -

- Synonym: phenylethane
- colorless liquid
- aromatic odour
- soluble in alcohol, benzene and ether

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -	2	
Chronic Local -		
Chronic Systemic -		

Additional Information -

- highly irritating, especially to the eyes
- moderately toxic by skin absorption
- inflammation may result upon contact with skin

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - Tentative Design Standard: 4000 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 100 ppm; 435000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	100	435000
Sweden		

D. Additional Information:

IV COMMENTS

- Used as an intermediate in production of styrene
- Used as a solvent

ETHYL CHLORIDE

I PROPERTIES

Physical State (ambient temp.) -	G
Vapour Pressure ($25^{o}C$) -	1079 mm Hg
Chemical Formula -	CH_3CH_2Cl
Molecular Weight -	64.5
Boiling Point -	12.3 C
Melting Point -	-136.4 C
Solubility in Water -	Slightly Soluble

Additional Information -

- Synonym: Chloroethane, Muriatic Ether, Hydrochloric Ether
- Colorless gas; ether-like odor; burning taste
- Miscible with most commonly-used solvents

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	2	1
Acute Systemic -	2	
Chronic Local -		
Chronic Systemic -		

Additional Information -

- Least toxic of all chlorinated hydrocarbons
- Irritant to eyes
- A central nervous system depressant, but effects are usually transient

ETHYL CHLORIDE (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 1000 ppm; 2,600,000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	1000	2,600,000
Sweden		

D. Additional Information:

- TLV (U.S) of 1000 ppm adopted to prevent signs of narcotic effects.

IV COMMENTS

- Used in manufacture of tetraethyl lead and ethylcellulose
- Used as an anesthetic and alkylating agent
- Production of insecticides
- Solvent for fats, oils, waxes, and resins

ETHYLENE DIBROMIDE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25°C) -	14.7 mm Hg
Chemical Formula -	CH_2BrCH_2Br
Molecular Weight -	187.9
Boiling Point -	131.4 C
Melting Point -	9.3 C
Solubility in Water -	Slightly Soluble

Additional Information -

- Synonym: 1,2 - Dibromoethane
- Colourless heavy liquid; sweet odour
- Miscible with most solvents

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		3
Acute Systemic -	3	
Chronic Local -		2
Chronic Systemic -	2	

Additional Information -

- Toxic effects resemble those of ethylene dichloride
- Strong irritant to eyes and skin
- In high doses, causes damage to liver and kidneys. Can be fatal
- Inhalation also causes pulmonary lesions
- A central nervous system depressant, but less severe than ethylene dichloride.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 20 ppm; 145000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany (skin)	25	190000
Sweden		

D. Additional Information:

- U.S. Occupational Standards:

Time Weighted Average	20 ppm
Ceiling Value:	30 ppm
Peak Value:	50 ppm (5 min/8 hours)

IV COMMENTS

-Pesticides; refining and blending of oils, greases and petroleum; pharmaceuticals, medicine.

ETHYLENE DICHLORIDE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^oC) -	75.7 mm Hg
Chemical Formula -	CH_2ClCH_2Cl
Molecular Weight -	99.0
Boiling Point -	83.5 C
Melting Point -	-35. 7 C
Solubility in Water -	Soluble

Additional Information -

- Synonym: 1,2 - dichloroethane, EDC
- colourless liquid
- pleasant odour, sweet taste
- miscible with alcohol, chloroform, ether

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		3
Acute Systemic -	3	
Chronic Local -		2
Chronic Systemic -	3	

Additional Information -

- toxic through ingestion and skin absorption
- vapor may cause damage to the eyes
- vapor irritates respiratory system
- produces narcotic effect
- ingestion may cause liver and kidney injury and death

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 50 ppm; 200000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	20	80,000
Sweden	20	80,000

D. Additional Information:

- U.S. Occupational Standards:
  Time Weighted Average: 50 ppm
  Ceiling Value: 100 ppm
  Peak Value 200 ppm (5 min/3 hours)

IV COMMENTS

- solvent for fats, oils, waxes, gums resins and rubber
- manufacture of acetyl cellulose
- used in manufacture of vinyl chloride

ETHYLENE OXIDE

I PROPERTIES

Physical State (ambient temp.) -	G
Vapour Pressure (25°C) -	1095 mm Hg @ 20 C
Chemical Formula -	$(CH_2)_2O$
Molecular Weight -	44.1
Boiling Point -	10.7 C
Melting Point -	– 111.3 C
Solubility in Water -	Soluble

Additional Information -

- Synonym: 1,2 - Epoxyethane , Dimethylene Oxide
- Colorless Gas
- Soluble in organic solvents

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		3
Acute Systemic -	2	
Chronic Local -		2
Chronic Systemic -		

Additional Information -

- irritates the eye and nose
  Exposure to low concentrations of vapour above threshold limit may cause nausea and vomiting. Continuous exposure results in numbing of sense of smell. High concentrations can produce pulmonary edema and mucous membrane irritation.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 28500 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 50 ppm; 90000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	50	90000
Sweden	20	36000

D. Additional Information:

- Soviet TLV (1966) 0.5 ppm

IV COMMENTS

- Plastics and resins, soaps and cleaning compounds
- intermediate for ethyleneglycol production (antifreeze)
- raw material in acrylonitrile production
- used throughout organic chemical industry

ETHYLENIMINE

I PROPERTIES

Physical State (ambient temp.) - L

Vapour Pressure ($25^{o}C$) - 160 mm Hg @ 20 C

Chemical Formula - $NHCH_2CH_2$

Molecular Weight - 43.1

Boiling Point - 56 C

Melting Point - -71.5 C

Solubility in Water -

Additional Information -

- Synonyms: ethylene imine; dimethylenimine; Aziridine; Azacyclopropane; Azirane; Dimethylaminoethylene
- clear, colourless oil; pungent, ammonia-like odour
- miscible with most organic solvents

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		3
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -		

Additional Information -

- highly toxic and corrosive. Absorbed by skin
- can cause allergic sensitization of skin. Can also cause severe eye injury
- recognized as a carcinogen by OSHA (U.S.), Germany, and Sweden

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 0.5 ppm; 1000 ug/m^3
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany (skin)	0.5	1000
Sweden		

D. Additional Information:

- Soviet TLV (1966) 0.01 ppm
- U.S. Occupational Standard: Carcinogen

IV COMMENTS

- used as an intermediate and monomer for fuel oil and lubricant refining
- used in manufacturing of pharmaceuticals, adhesives, polymer stabilizers

FORMALDEHYDE

I PROPERTIES

Physical State (ambient temp.) -	G
Vapour Pressure (25^{o}C) -	767 mm Hg at -19.5 C
Chemical Formula -	HCHO
Molecular Weight -	30.0
Boiling Point -	-21 C
Melting Point -	-92 C
Solubility in Water -	Soluble

Additional Information -

- Synonym: Methanal, Methyl Aldehyde
- Colorless gas with strong pungent odor
- Readily polymerizes at normal temperature and so is not available as a gaseous monomer. Available commercially as a 37-50% aqueous solution with 15% methanol to inhibit polymerization (Formalin).

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		3
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -		

Additional Information -

- irritates mucous membranes of eyes, nose, throat, respiratory tract
- solutions have hardening or tanning action on the skin; may cause dermatitis

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 65 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 12 ppm; 3000 ug/m^3 (ceiling)

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	1	1200 (ceiling)
Sweden	2	3000 (ceiling)

D. Additional Information:

- TLV (U.S.) of 2 ppm adopted to prevent respiratory injury
- Soviet TLV (1966) 0.8 ppm
- Czechoslovakia (1969) 1.6 ppm
- American National Standards Institute TLV (1967) 3 ppm
- U.S. Occupational Standard 3 ppm (time weighted average)
  Ceiling Value 5 ppm
  Peak Value 10 ppm 10 ppm (30 min/8 hours)

IV COMMENTS

- Pulp and paper, paint and varnish, sulphur and sulphuric acid, textiles and leather, pharmaceuticals and medicine.
- Used as a fertilizer and fungicide.

FORMIC ACID

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^{o}C) -	33.3 mm Hg
Chemical Formula -	HCOOH
Molecular Weight -	46.0
Boiling Point -	100.8 C
Melting Point -	8.2 C
Solubility in Water -	Very Soluble

Additional Information -

- Synonym: Methanoic Acid, Hydrogen Carboxylic Acid
- Colorless, fuming liquid
- Pungent, penetrating odor
- Soluble in alcohol and ether.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -	2	
Chronic Local -		2
Chronic Systemic -		

Additional Information -

- dangerously caustic to the skin.
- produces blisters almost instantly.
- fumes extremely irritating to mucous membranes

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - Tentative Design Standard: 1500 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 5 ppm; 9000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	5	9000
Sweden		

D. Additional Information:

- TLV (U.S.) of 5 ppm adopted to prevent irritation of eyes, skin, and respiratory passages.

IV COMMENTS

- Used in dying and finishing of textiles and paper. Also leather treatment.
- Manufacture of fumigants, insecticides, lacquers, and refrigerants.

HYDROGEN CHLORIDE

I PROPERTIES

Physical State (ambient temp.) -	G
Vapour Pressure (25^{o}C) -	
Chemical Formula -	HCl
Molecular Weight -	36.46
Boiling Point -	-84.9
Melting Point -	- 114.8 C
Solubility in Water -	Soluble

Additional Information -

- Colorless gas; suffocating odor
- Soluble in alcohol and ether

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		3
Acute Systemic -	3	
Chronic Local -		2
Chronic Systemic -		

Additional Information -

- severe exposures may cause pulmonary edema
- exerts destructive action on mucous membranes and skin
  Exposure to gas results in chemical burns or dermatitis.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - $100\ ug/m^3$

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (ceiling) 5 ppm; $7000\ ug/m^3$

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	5	7000 (ceiling)
Sweden	5	7000 (ceiling)

D. Additional Information:

- TLV (U.S.) of 5 ppm adopted to prevent severe irritation
- Soviet TLV (1966) 4 ppm
- Czechoslovakia (1969) 5 ppm
- U.S. Occupational Standard: Ceiling Value 5 ppm

IV COMMENTS

- Plastics, synthetic resins, organic chemical industry in general. Source incineration of chlorinated hydrocarbons, including vinyl chloride monomer
- Used in food industry: 1) in manufacture of monosodium glutamate, 2) as hydrolyzing agent in manufacture of dextrose and syrups from startch. Metal industry: used in removal of scale and oxides (pickling), reclamation of iron from low-grade ores and as an etching medium.
- Rubber reclamation

HYDROGEN CYANIDE

I PROPERTIES

Physical State (ambient temp.) -	G
Vapour Pressure (25^{o}C) -	613 mm Hg
Chemical Formula -	HCN
Molecular Weight -	27.04
Boiling Point -	25.7 C
Melting Point -	- 13.24 C
Solubility in Water -	Very Soluble

Additional Information -

- Colorless gas. Faint characteristic odor of bitter almonds
- Dissolves in water to form hydrocyanic acid (Prussic Acid)
- Soluble in alcohol and ether

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -		

Additional Information -

- A protoplasmic poison
- causes death through asphyxiation. Combines with enzymes associated with cellular oxidation; prevents oxygen uptake, Suspension of tissue oxidation lasts only while cyanide is present; normal function restored upon its removal
- may cause systemic damage by absorption through the skin

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 1150 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 10 ppm; 11000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany *(skin)*	10	11000
Sweden *(skin)*	10	11000

D. Additional Information:

- Soviet TLV (1966) 0.3 ppm
- Czechoslovakia TLV (1969) 2.7 ppm

IV COMMENTS

- Used in preparation of numerous chemical products and intermediates
- Used as a disinfectant.

HYDROGEN CYANIDE

I PROPERTIES

Physical State (ambient temp.) -	G
Vapour Pressure (25^{o}C) -	613 mm Hg
Chemical Formula -	HCN
Molecular Weight -	27.04
Boiling Point -	25.7 C
Melting Point -	- 13.24 C
Solubility in Water -	Very Soluble

Additional Information -

- Colorless gas. Faint characteristic odor of bitter almonds
- Dissolves in water to form hydrocyanic acid (Prussic Acid)
- Soluble in alcohol and ether

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -		

Additional Information -

- A protoplasmic poison
- causes death through asphyxiation. Combines with enzymes associated with cellular oxidation; prevents oxygen uptake, Suspension of tissue oxidation lasts only while cyanide is present; normal function restored upon its removal
- may cause systemic damage by absorption through the skin

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 1150 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 10 ppm; 11000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany *(skin)*	10	11000
Sweden *(skin)*	10	11000

D. Additional Information:

- Soviet TLV (1966) 0.3 ppm
- Czechoslovakia TLV (1969) 2.7 ppm

IV COMMENTS

- Used in preparation of numerous chemical products and intermediates
- Used as a disinfectant.

HYDROGEN FLUORIDE

I PROPERTIES

Physical State (ambient temp.) -	G
Vapour Pressure (25^{o}C) -	906 mm Hg
Chemical Formula -	HF
Molecular Weight -	20.0
Boiling Point -	19.4 C
Melting Point -	-92.3 C
Solubility in Water -	Very Soluble
Additional Information -	

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		3
Acute Systemic -	3	
Chronic Local -		2
Chronic Systemic -	3	

Additional Information -

- highly irritating and corrosive to skin, eyes, mucous membranes and lungs
- inhalation may cause ulcers of upper respiratory tract
- hydrofluoric acid produces severe skin burns. Affects subcutaneous tissues and may lead to gangrene.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

	Total Fluorides (expressed as HF)
Point of Impingement (half-hour average) -	(APR-OCT) 8.6 ug/m^3 (OCT-APR) 17.2 ug/m^3
Average Concentration over 24 hours -	(APR-OCT) 1.72 ug/m^3 (OCT-APR) 3.44 ug/m^3

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 3 ppm; 2000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	3	2000
Sweden	3	2000

D. Additional Information:

- TLV (U.S.) of 3 ppm adopted to prevent irritating effects
- Soviet TLV (1966) 0.7 ppm
- Czechoslovakia (1969) 1.2 ppm
- American National Standards Institute TLV (1966) 3 ppm

IV COMMENTS

Hydrogen Fluoride:

- Fluorinating agent in organic and inorganic reactions
- Production of fluorine , aluminum fluoride and aluminum
- catalyst in alkylation, isomerization and polymerizing reactions

Hydrofluoric Acid:

- Polishing, etching of glass
- Source of fluorine for aluminum production
- Pickling and electropolishing agent for metals.

IODINE

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^oC) -	1 mm Hg at 38.7 C
Chemical Formula -	I_2
Molecular Weight -	253.8
Boiling Point -	184 C
Melting Point -	113.5 C
Solubility in Water -	Slightly Soluble

Additional Information -

- Violet-black crystals, metallic lustre
- Readily sublimes to violet vapor
- Characteristic odor
- Soluble in alcohol and common organic solvents

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		3
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -	3	

Additional Information -

- More irritating and corrosive than chlorine and bromine
- Irritative to eyes, skin, upper respiratory tract, and lungs.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (ceiling) 0.1 ppm; 1000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	0.1	1000 (ceiling)
Sweden	0.1	1000 (ceiling)

D. Additional Information:

- TLV (U.S.) of 0.1 ppm adopted to prevent irritative effects
- Soviet TLV (1967) 0.1 ppm
- U.S. Occupational Standard: Ceiling Value 0.1 ppm

IV COMMENTS

- Used in manufacture of dyes and pharmaceuticals

IRON AND IRON COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P.	B.P. C	M.P. C	Sol In H_2O
Iron	Fe	55.85	S		3000	1536	INSOL.
Blue							
2-Ethylhexoate							
Napthenate							
Oxides	Fe_2O_3	159.68	S			decomp.	INSOL.
Oxide, Synthetic	Fe_3O_4	231.54				1538	INSOL.
Selenide							
Sorbitol							
Tallate	Salt of tall oil mixture of rosin acids and fatty acids.						
Ferric or Ferrous							
-ic Chloride	$FeCl_3$	162.22	S		319	282	SOL.
-ic Nitrate	$Fe(NO_3)_3.6H_2O$	349.96	S			35	SOL.
Ferrocene	$C_{10}H_{10}Fe$	186	S			174	INSOL.
-ous Fumarate	$FeC_4H_2O_4$	170	S				SOL.
-ous Phosphide	Fe_2P	142.68	S				INSOL.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	0	0
Acute Systemic -	1	
Chronic Local -	0	0
Chronic Systemic -	3	

Additional Information -

- iron dust can be irritative and cause injury to eye.
- inhalation of iron oxide fume causes siderosis, pulmonary fibrosis and an increased incidence of lung cancer(as co-carcinogen
- also causes chronic bronchitis and metal fume fever
- iron compounds are suspected carcinogens of the lung, liver, connective tissue.
- Some iron compounds found to be carcinogenic in animal experiments.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - Ferric oxide: 75 ug/m^3
metallic iron 10 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - Iron oxide fume: 5000 ug/m^3
Iron pentacarbonyl: 0.01 ppm, 80 ug/m^3
(Over 8 Hours) - Soluble iron salts: 1000 ug/m^3 (as Fe)

C. Occupational Standards (TLV) Elsewhere:

		ppm	ug/m^3
West Germany	Iron oxide fume:	-	8000
	Iron pentacarbonyl	0.1	800
Sweden	Iron oxide fume:		5000

D. Additional Information:

- U.S. Occupational Standard for iron oxide fume: time weighted average 10000 ug/m^3

IV. COMMENTS

KEROSENE

I PROPERTIES

Physical State (ambient temp.) - L

Vapour Pressure (25^oC) -

Chemical Formula - Mixture of petroleum hydrocarbons (C_{10}-C_{16} aliphatics)

Molecular Weight -

Boiling Point - 175-325 C

Melting Point -

Solubility in Water - Insoluble

Additional Information -

- Synonym: fuel oil No.1
- pale, yellow - white, oily liquid

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		1
Acute Systemic -	2	
Chronic Local -		2
Chronic Systemic -	2	

Additional Information -

- inhalation may cause headache and stupor
- skin irritant
- ingestion cause gastrointestinal irritation

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

IV COMMENTS

- rocket and jet engine fuel
- domestic heating
- solvent
- insecticide
- diesel and tractor fuels

LEAD AND LEAD COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P.	B.P. C	M.P. C	Sol In H_2O
Lead	Pb	207.2	S		1755	327.4	
Acetate	$Pb(C_2H_3O_2)_2$	810.0	S			280	V. SOL.
Azide	$Pb(N_3)_2$	291.23	S		Explodes 350		SL.SOL.
Azotetrazole							
Carbonate	$PbCO_3$	267.20	S			decomp 315	
Chloride	$PbCl_2$	278.10	S		950	501	SOL.
Chromate	$PbCrO_4$	323.18	S			844	INSOL
Dinitroresorcinate							
2-Ethyl hexoate			L				
Fluoborate							
Fumarate			S				
Isodecanoate							
Naphthenates						100	
Neodecanoate							
Nitrate	$Pb(NO_3)_2$	331.2				470	V. SOL.
Dioxide	PbO_2	239.19	S			290	INSOL.
Monoxide	PbO	223.19	S			888	SL.SOL.
Tetroxide	Pb_3O_4	685.57	S		1472	890	INSOL.
Sesquioxide	Pb_2O_3	462.38	S			370	INSOL.
Suboxide	Pb_2O	430.38	S			decomp.	INSOL.
Perchlorate	$Pb(ClO_4)_2 \cdot 3H_2O$	460.14	S			decomp. 100 C	V. SOL.
Ortho-phosphite	$PbHPO_3$	287.17	S			decomp	INSOL.
Phthalate	$C_6H_4(COO)_2Pb \cdot PbO$	594	S				
Silicate	$PbSiO_3$	283.27				766	INSOL.

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P. 25 C	B.P. C	M.P. C	Sol In H_2O
Stearate	$Pb(C_{18}H_{35}O_2)_2$	774.15	S			115.7	SL.SOL.
Styphnate	$C_6H(NO_2)_3(O_2Pb)$					detonates 260	
Sulphate	$PbSO_4$	303.25				decomp 1000	SL.SOL.
" basic	$PbSO_4 \cdot PbO$	526.44				977	SL.SOL.
Tallate	Salt of tall oil mixture of rosin acids and fatty acids						
Tetraethyl	$Pb(C_2H_5)_4$	323.5	L	$<$ 1 mm	198-202 C	125-150 C	

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	0	0
Acute Systemic -	3	
Chronic Local -	0	0
Chronic Systemic -	3	

Additional Information -

- intake through inhalation, ingestion or through skin (particularly organic cpds)
- symptoms develop more rapidly when lead inhaled
- cumulative poison; increasing amounts build up in body
- toxicity of various compounds depends on their solubility in body fluids, and particle size. Carbonate, Monoxide, Sulfate are most toxic
- producing varying symptoms depending on type and degree of exposure
- several lead compounds (acetate, carbonate, chromate, phosphate, subacetate) are recognized animal carcinogens. Lead and compounds are suspected carcinogens of lungs and kidneys.

LEAD AND LEAD COMPOUNDS (3)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

all forms: (as Pb)

Point of Impingement (half-hour average) - 10 ug/m^3

Average Concentration over 24 hours - 5.0 ug/m^3

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - Lead, Inorganic Comps: 150 ug/m^3
Lead, Arsenate: 150 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany	Lead, Inorganic Comps:	200 ug/m^3
Sweden	Lead, Inorganic Comps:	100 ug/m^3

D. Additional Information:

- Soviet TLV (1966) 10 ug/m^3
- East and West Germany, Holland TLV 200 ug/m^3
- Great Britain, Yugoslovia TLV 150 ug/m^3
- Czechoslovakia, Poland, Japan TLV 50 ug/m^3
- Hungary TLV 20 ug/m^3
- American National Standards Institute TLV(1969) 200 ug/m^3
- U.S. Occupational Standard for Lead: Time Weighted Average 200 ug/m^3

IV COMMENTS

MAGNESIUM AND MAGNESIUM COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P. 25 C	B.P. C	M.P. C	Sol In H_2O
Magnesium	Mg	24.305			1107	650	INSOL.
Acetate	$Mg(C_2H_3O_2)_2$	142.4	S			decomp. 323	V.SOL
Bile Salts							
Calcium Carbonate							
Chloride	$MgCl_2$	95.22	S		1412	708	V.SOL
Hydroxide	$Mg(OH)_2$	58.33	S				SL. SOL
Lauryl Sulphate							
Lignosulphonates							
Naphthenates							
Nitrate	$Mg(NO_3)_2.2H_2O$	184.35	S			129	SOL.
Oxide	MgO	40.31	S		3600	2800	SLSOL
Salicylate	$Mg(C_7H_5O_3)_2.4H_2O$	370.61	S				SOL.
Silicate	$MgSiO_3$	100.40	S			decomp. 1557	INSOL
Stearate	$Mg(C_{18}H_{35}O_2)_2$	591.27	S			186-188	SL.SO
Sulphate	$MgSO_4$	120.37	S			decomp. 1124	V.SOL
Xylene Sulphonate							

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		1
Acute Systemic -	2	
Chronic Local -		2
Chronic Systemic -		

Additional Information -

- inhalation of freshly sublimed oxide may cause metal fume fever. No evidence of systemic poisoning.
- irritative to skin. Particles embedded in skin can produce severe local lesions characterized by evolution of gas and acute inflammatory reaction

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - Magnesium Oxide: 100 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - Magnesium Oxide fume: 10000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany	MgO	8000 ug/m^3
Sweden		

D. Additional Information:

MALEIC ANHYDRIDE

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^{o}C) -	0.387 mm Hg
Chemical Formula -	OCOCHCHCO
Molecular Weight -	98.06
Boiling Point -	198 C
Melting Point -	60 C
Solubility in Water -	Soluble

Additional Information -

- Synonym: Toxilic Anhydride,cisbutenedioic Anhydride
- Fused black or white crystals
- Hydrolyzes slowly in water
- Soluble in acetone, hydrocarbons, ether, chloroform, petroleum ether

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		3
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -		

Additional Information -

- inhalation can cause pulmonary edema
- subacute inhalation leads to severe headache, nosebleed, nausea and temporary impairment of vision
- closely resembles and is more potent than Phthalic Anhydride in its toxicologic properties of skin, eye, and upper respiratory tract irritation.
- Carcinogenic in some animal experiments

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 0.25 ppm; 1000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	0.2	800
Sweden	0.3	1000

D. Additional Information:

- TLV (U.S.) of 0.25 ppm adopted on basis of analogous but more severe toxic action in comparison with Phthalic Anhydride.

IV COMMENTS

- Used primarily in making polyester resins. Also used in production of Fumaric Acid, Insecticides (such as Malathion), Maleic Hydrozide, and Alkyd Resins.

MANGANESE AND MANGANESE COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P. 25 C	B.P. C	M.P. C	Sol In H_2O
Manganese	Mn	54.94	S		2097	1245	INSOL.
Carbonate	$MnCO_3$	114.95	S				SL.SOL.
Dioxide	MnO_2	86.94	S				INSOL.
2-Ethylhexoate							
Isodecanoate							
Linoleate							
Naphthenate							
Neodecanoate							
Soaps							
(II) Sulphate	$MnSO_4$	151.00			850	700	V. SOL.
Tallate	Salt of tall oil mixture of rosin acids and fatty acids.						

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -	2	
Chronic Local -		
Chronic Systemic -	3	

Additional Information -

- main effect of chronic inhalation of manganese dusts and fumes is on central nervous system. Damage may be permanent. Also suspected to cause pneumonitis and upper respiratory infections.

MANGANESE AND MANGANESE COMPOUNDS (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - all forms: 100 ug/m^3 (as Mn)

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - Metal and compounds: (ceiling) 5000 ug/m^3 (as Mn)

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

		ug/m^3
West Germany	Metal and compounds: (ceiling)	5000 (as Mn)
Sweden	Metal and compounds: (ceiling)	2500 (as Mn)

D. Additional Information:

- Soviet TLV (1966) 300 ug/m^3
- Czechoslovakia TLV (1969) 2000 ug/m^3
- American National Standards Institute TLV (1948) 6000 ug/m^3

IV COMMENTS

- about 90% used in metallurgy
  - alloying agent in steels
  - alloying agent in Al, Sb, Cu (improve corrosion resistance and hardness)
  - purifying and scavenging agent in metal production
- Remainder consumed by chemical industry.

MERCURY AND MERCURY COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P. 25 C	B.P. C	M.P. C	Sol In H_2O
Mercury	Hg	200.59	S		356.6	-38.9	INSOL.
-ic Chloride	$HgCl_2$	271.50	S	< 1 mm	302	276	SOL.
-ic Nitrate	$Hg(NO_3)_2 \cdot 1/2\ H_2O$	336.61				decomp. 79	V. SOL.
-ic Oxide	HgO	216.59				decomp. 500	SL.SOL.
-ous Nitrate	$Hg_2(NO_3)_2.2H_2O$	561.22				70	decomp.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		3
Acute Systemic -	3	
Chronic Local -		2
Chronic Systemic -	3	

Additional Information -

- -readily absorbed via respiratory tract, intact skin and gastrointestinal tract
- -circulates in blood and stored in liver, kidneys, spleen, and bone.
- -causes damage to central nervous system. Also kidney damage.
- -soluble salts are corrosive to skin and mucous membranes. Causes dermatitis
- - causes inflammation of mouth and gums

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -	all forms: 5.0ug/m^3 Alkyl compounds : 1.5 ug/m^3
Average Concentration over 24 hours -	2.0 ug/m^3

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -	Alkyl compounds: -skin	.001 ppm; 10 ug/m^3
(Over 8 Hours) -	all forms	50 ug/m^3

C. Occupational Standards (TLV) Elsewhere:

		(ppm)	(ug/m^3)
West Germany	Alkyl compds - skin:		10
	all forms:	.01	100
Sweden	Alkyl compds - skin:		10
	all forms:		50

D. Additional Information:

All forms except Alkyl

- Soviet TLV (1967) 10 ug/m^3
- Czechoslovakia TLV (1969) 50 ug/m^3
- American National Standards Institute TLV (1943) 100 ug/m^3

Alkyl Compounds

- American National Standards Institute TLV (1969) 10 ug/m^3

IV COMMENTS

- major uses (with percentages of total consumption) are as follows

- electrical apparatus	28.3 %
- electrolytic preparation of chlorine and caustic soda	20.2%
- paints	18.4%
- industrial and control instruments	8.1%
- Pharmaceuticals	7.8%
- Agricultural	7.3%
- Catalysts	1.9%
- Pulp and paper	1.4%

METHYL CHLORIDE

I PROPERTIES

Physical State (ambient temp.) -	G
Vapour Pressure (25°C) -	
Chemical Formula -	CH_3Cl
Molecular Weight -	50.5
Boiling Point -	-23.7 C
Melting Point -	-97.7 C
Solubility in Water -	Slightly Soluble

Additional Information -

- Synonyms: Chloromethane, Monochloromethane
- colorless gas; faintly sweet, ether-like odour
- soluble in alcohol and other common organic solvents

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	1	1
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -	2	

Additional Information -

- weak irritant and weak narcotic
- repeated low-level exposure causes damage to the central nervous system, liver, kidneys, bone marrow, and cardiovascular system
- high-level exposures may be fatal owing to degenerative changes in the heart, liver, and especially the kidneys

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - In preparation

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 100 ppm; 210,000 ug/m^3.

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	50	105,000
Sweden		

D. Additional Information:

- U.S. Occupational Standard
  Time Weighted Average: 100 ppm
  Ceiling Value 200 ppm
  Peak Value 300 ppm (5 min/3hours)

- Soviet TLV (1967) 2.5 ppm
- Czechoslovakia TLV (1969) 50 ppm
- American National Standards Institute TLV (1969) 100 ppm

IV COMMENTS

- Methylating agent in organic synthesis
- used as a propellant, refrigerant, and in the production of tetramethyl lead, silicones
- used in low temperature polymerization

METHYLCHLOROMETHYL ETHER

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^{o}C) -	
Chemical Formula -	CH_2ClOCH_3
Molecular Weight -	76.5
Boiling Point -	59.5
Melting Point -	-103.5 C
Solubility in Water -	decomposes

Additional Information -

- synonyms: Dimethylchloroether, Chloromethyl Methyl Ether, Monochlorodimethyl ether, CMME
- clear, colorless liquid
- Soluble in alcohol and ether

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- recognized as a carcinogen by OSHA (U.S.), Germany, Sweden

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- U.S. Occupational Standard: Carcinogen

IV COMMENTS

METHYLENE CHLORIDE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^oC) -	428 mm Hg
Chemical Formula -	CH_2Cl_2
Molecular Weight -	84.9
Boiling Point -	39.8 C
Melting Point -	-96.7 C
Solubility in Water -	Slightly Soluble

Additional Information -

- Synonyms: Dichloromethane
- colorless volatile liquid
- penetrating, ether-like odor
- soluble in alcohol and ether

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -	1	

Additional Information -

- irritating to the eyes and respiratory tract, and may produce pulmonary edema
- one of the least toxic chlorinated hydrocarbons. But its narcotic powers are quite strong and it may produce central nervous depression. Human fatalities have occurred.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - Tentative Design Standard: 100,000 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 200 ppm; 720000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	500	1,750,000
Sweden	100	350,000

D. Additional Information:

- TLV (U.S.) of 100 ppm is adopted to prevent any significant narcotic effects
- American National Standards Institute TLV (1969) 500 ppm
- Soviet TLV (1967) 15 ppm
- Czechoslovokia (1969) 140 ppm
- U.S. Occupational Standards
  Time Weighted Average 500 ppm
  Ceiling Value 1000 ppm
  Peak Value 2000 ppm (5 min/2 hours)

IV COMMENTS

- used as paint remover, refrigerant, degreasing solvent, fumigant, local anesthetic, propellant
- used in pharmaceutical, food, and textile and leather industries

4,4' - METHYLENE (bis) 2-CHLOROANILINE

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25°C) -	
Chemical Formula -	$CH_2(C_6H_4ClNH_2)_2$
Molecular Weight -	
Boiling Point -	
Melting Point -	99-107
Solubility in Water -	

Additional Information -

- Synonyms: MBCA, 3,3' - dichloro -4,4' - diaminodiphenylmethane
- tan coloured solid
- soluble in acetone, esters, and aromatic agents.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- regarded as a carcinogen by OSHA (U.S.) and Sweden

4,4' - METHYLENE (bis) 2 - CHLOROANILINE (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- U.S. Occupational Health Standard: Carcinogen

IV COMMENTS

- Used as a curing agent for several elastomers and epoxy resins.

MOLYBDENUM AND MOLYBDENUM COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P.	B.P. C	M.P. C	Sol In H_2O
Molybdenum	Mo	95.94	S		5560	2610	INSOL.
Molybdate Orange							
Disulphide	MoS_2	160.07	S			1185	INSOL.
Dioxide	MoO_2		S				INSOL.
Trioxide	MoO_3	143.94	S		1155	795	SOL.
(III) Oxide	Mo_2O_3	239.90	S				INSOL.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		1
Acute Systemic -		
Chronic Local -		
Chronic Systemic -	1	

Additional Information -

- Molybdenum Cpds: no reported cases of industrial poisoning. Rapidly excreted by body; not stored.
- General agreement that Molybdenum compounds exhibit low order of toxicity

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

		ug/m^3
Threshold Limit Value -	Soluble Compounds:	5000
(Over 8 Hours) -	Insolbule Compounds:	10000

C. Occupational Standards (TLV) Elsewhere:

		ug/m^3
West Germany	Soluble Compounds:	5000
	Insoluble Compounds:	10000
Sweden		

D. Additional Information:

- Soviet TLV (1966); Soluble compounds 4000 ug/m^3
  Insoluble Compounds 6000 ug/m^3

IV COMMENTS

- about 85% of all Mo produced is used as an alloying agent in iron-base alloys (alloy steels, stainless steels, tool steels, alloy cast iron)
- remainder used in production of Mo chemicals.

MORPHOLINE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure ($25^{o}C$) -	6.6 mm at 20 C
Chemical Formula -	$\overline{OCH_2CH_2NHCH_2CH_2}$
Molecular Weight -	87.1
Boiling Point -	128 C
Melting Point -	-4.8 C
Solubility in Water -	Very Soluble

Additional Information -

- Synonyms: Tetrahydro - 1,4 - oxazine, Diethylenimide oxide
- colorless, hygroscopic oil; volatile with steam
- characteristic amine-like odor
- soluble in organic solvents
- strongly alkaline

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -	2	
Chronic Local -		
Chronic Systemic -		

Additional Information -

- liquid and vapor are irritating to skin, eyes, and mucous membrances
- has produced kidney and liver damage in experimental animals
- industrial use has resulted in some cases of respiratory tract irritation but no chronic effects have been reported

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 20 ppm; 70000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany (skin)	20	70000
Sweden		

D. Additional Information:

- U.S. TLV of 20 ppm adopted to prevent irritation and harmful effects on the eyes

IV COMMENTS

- used as a solvent for resins, waxes, dyes
- morpholine fatty acid salts are used as surface active agents and emulsifiers
- other morpholine compounds are used as corrosion inhibitors, anti-oxidants, plasticizers, insecticides and herbicides.

NAPHTHALENE

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^oC) -	0.0866 mm Hg
Chemical Formula -	$C_{10}H_8$
Molecular Weight -	128.2
Boiling Point -	217.9 C
Melting Point -	80.1 C
Solubility in Water -	Slightly Soluble

Additional Information -

- Synonyms: Tar Camphor, White tar, Naphthene, Moth Flakes
- most abundant single component of coal tar
- white crystalline, volatile flakes. Sublimes slowly at room temperature
- strong aromatic odor
- moderately soluble in benzene, very soluble in alcohol and ether.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -	2	
Chronic Local -		1
Chronic Systemic -	1	

Additional Information -

- irritating to eyes
- inhalation can cause headache, nausea, and loss of appetite Injury to the cornea and kidney damage have also been reported.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 10 ppm; 50000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	10	50000
Sweden		

D. Additional Information:

- U.S. TLV OF 10 ppm is adopted to prevent corneal injury.

IV COMMENTS

- about 75% of total production used in the production of phthalic anhydride
- an intermediate in production of various products (naphthol, "Tertralin", "Decalin", chlorinated naphthalenes)
- chlorinated naphthalenes used as solvents for fire proofing and waterproofing fabrics
- used as an insecticide

NAPHTHYLAMINE (α and β)

I PROPERTIES

Physical State (ambient temp.) - S

Vapour Pressure ($25^{o}C$) - 1 mm Hg @ 106 C

Chemical Formula - $C_{10} H_7 NH_2$

Molecular Weight - 143.2

Boiling Point - 300 C (for α); 306C (for β)

Melting Point - 50C (for α); 112C (for β)

Solubility in Water - α: slightly soluble

Additional Information - β: soluble

α form

- synonyms: 1-Naphthylamine, 1-Aminonapthalene, Naphthalidam, Naphthalidine
- White crystals, reddening on exposure to air
- Soluble in alcohol and ether
- Unpleasant odor

β form

- Synonyms: 2-Naphthylamine, 2-Aminonaphthalene, 2-Naphthalamine, 2- Naphthalamine
- White to faint pink flakes. Faint aromatic odor
- Soluble in alcohol, ether, benzene

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -	3	

Additional Information -

- can be absorbed into body via lungs, gastrointestinal tract, and skin
- long and continued exposures to even small amounts can produce tumors and cancers of the bladder
- recognized as a carcinogen by OSHA (U.S.), Germany, and Sweden

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- U.S. Occupational Standard: Carcinogen

IV COMMENTS

- used as dyes and dye intermediates.

NICKEL AND NICKEL COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P. 25 C	B.P. C	M.P. C	Sol In H_2O
Nickel	Ni	58.71			2900	1455	INSOL.
Carbonate	$NiCO_3$	118.72	S		decomp.		SL.SOL.
Carbonyl	$Ni(CO)_4$	170.75	L or S		43	-25	SL.SOL.
Chloride	$NiCl_2$	129.62	S		Subl. 973	1001	V.SOL.
2-Ethylhexoate							
Ferrite							
Oxide	NiO	74.71	S			1990	INSOL.
(II) Acetate	$Ni(C_2H_3O_2)_2$	176.80	S		16.6	decomp.	INSOL.
Selenide	NiSe	137.67	S				INSOL.
Subsulfide	Ni_3S_2	240.26	S			790	INSOL.
Sulphate	$NiSO_4$	154.78	S			decomp. 848	V.SOL.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		1
Acute Systemic -	3	
Chronic Local -		3
Chronic Systemic -	3	

Additional Information -

- Several compounds are recognized carcinogens
- Human: $Ni(CO)_4$ (U.S. Sweden)
  Ni (respirable) (Sweden, West Germany)
  Animal: $Ni(CO)_4$ (West Germany)
- suspected carcinogens: Nickel subsulfide, Nickel Oxide
- Lung and sinus cancers observed in Nickel workers
- Respiratory disorders, gastric and laryngeal cancers and various sarcomas also observed
- causes chronic dermatitis

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - Nickel: 5 ug/m^3
$Ni(CO)_4$: 1.5 ug/m^3

Average Concentration over 24 hours - 2.0 ug/m^3

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - Metal, Insoluble Compounds: 1000 ug/m^3 (as NI)
Soluble compounds: 100 ug/m^3 (as Ni)

(Over 8 Hours) - Nickel Carbonyl: 0.1 ppm; 700ug/m^3

C. Occupational Standards (TLV) Elsewhere:

	ppm	ug/m^3
West Germany		
Sweden metal, insoluble compounds :		10

D. Additional Information:

IV COMMENTS

NITRIC ACID

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^{o}C) -	60.8 mm Hg
Chemical Formula -	HNO_3
Molecular Weight -	63.01
Boiling Point -	83 C
Melting Point -	-42 C
Solubility in Water -	Very Soluble

Additional Information -

- Synonyms: Aquo Fortis, Azotic Acid, Hydrogen Nitrate
- transparent, colorless, or yellowish, fuming liquid. A strong monobasic acid. Powerful oxidizing agent
- releases NO_2 on exposure to light, giving rise to yellow discoloration
- characteristic choking odor
- attacks almost all metals. Decomposes violently in alcohol
- exact composition of "fumes" or vapor depends on temperature, humidity and whether or not the acid is in contact with other materials such as heavy metals or organic compounds. Vapor may consist of a mixture of various nitrogen oxides and of nitric acid vapor.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	3	3
Acute Systemic -	3	
Chronic Local -		2
Chronic Systemic -		

Additional Information -

- irritant to mucous membranes of eyes and respiratory tract, and to skin
- vapor and mist are corrosive to teeth
- continued exposure to vapor may cause chronic bronchitis and pulmonary edema; more severe exposure may cause chemical pneumonitis
- usually found in conjunction with NO_2 which is more hazardous

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 100 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 2 ppm; 5000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	10	25000
Sweden	2	5000

D. Additional Information:

- U.S. TLV of 2 ppm adopted to prevent irritation and corrosion

IV COMMENTS

- about 75% used in manufacture of agricultural fertilizers (NH_4NO_3). About 15% used in explosives (nitrates and nitro-compounds). About 10% used by chemical industry.
- paint and varnish manufacture; photographic industry; petroleum refineries; pharmaceuticals, medicine; toilet preparations, metallurgy.

4 - NITROBIPHENYL

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^oC) -	
Chemical Formula -	$C_{12}H_9NO_2$
Molecular Weight -	199.21
Boiling Point -	340 C
Melting Point -	114 C
Solubility in Water -	Insoluble
Additional Information -	

- Synonyms: p-Nitrobiphenyl; p-Phenylnitrobenzene; 4-Phenylnitrobenzene
- Soluble in alcohol and ether

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- recognized as a carcinogen by OSHA (U.S.); and Sweden
- has caused cancer of the bladder in humans

4 - NITROBIPHENYL (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- U.S. Occupational Standard: Carcinogen

IV COMMENTS

N-NITROSODIMETHYLAMINE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^oC) -	
Chemical Formula -	$C_2H_6N_2O$
Molecular Weight -	74.1
Boiling Point -	152 C
Melting Point -	
Solubility in Water -	Soluble

Additional Information -

- Synonyms: Dimethylnitrosoamine, DMN
- yellow liquid
- soluble in alcohol and ether

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		3
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -	3	

Additional Information -

- highly toxic especially by skin contact
- has caused fatal liver disease in humans
- recognized as a carcinogen by OSHA (U.S.), Germany and Sweden
- no contact by any route should be permitted

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- U.S. Occupational Standard: Carcinogen

IV COMMENTS

- formed in ambient air by photochemical reaction between NO_x and dimethylamine

OXALIC ACID

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^oC) -	0.0065 mm Hg @ 55 C
Chemical Formula -	$COOHCOOH \cdot 2 H_2O$
Molecular Weight -	126.1
Boiling Point -	Sublimes at 150 C
Melting Point -	101 C (anhydrous 189 C)
Solubility in Water -	Soluble

Additional Information -

- Synonym: Ethanedioic Acid
- Transparent, colorless crystals
- soluble in alcohol and ether, insoluble in benzene

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	3	3
Acute Systemic -	3	
Chronic Local -	3	3
Chronic Systemic -	2	

Additional Information -

- systemic effects are most severe for ingestion. Poisoning by ingestion can be quickly fatal
- airborne dust and vapor are irritative to the eyes and upper respiratory tract, and cause ulceration of mucous membranes of the nose and throat, general irritability, headaches
- severe exposures cause albuminura , chronic cough, vomiting, general emaciation and weakness
- has a caustic effect on skin and may cause dermatitis

OXALIC ACID (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -	1000 ug/m^3
(Over 8 Hours) -	

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

IV COMMENTS

- used as a metal cleanser, purifying agent and as an intermediate for many compounds.
- used in leather tanning, and as a paint remover.

PENTAERYTHRITOL

I PROPERTIES

Physical State (ambient temp.) - S

Vapour Pressure (25^{o}C) -

Chemical Formula - $C(CH_2OH)_4$

Molecular Weight - 136.1

Boiling Point - 276 C (30 mm)

Melting Point - 262 C

Solubility in Water - Soluble

Additional Information -

- Synonyms: Pentek, Tetramethylomethane, Monopentaerythritol
- crystalline, white powder; odorless
- slightly soluble in alcohol. Insoluble in other common organic liquids

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- Low toxicity. Regarded as a nuisance dust.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 10000 ug/m^3
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D Additional Information:

IV COMMENTS

- used in manufacture of syn thetic resins, and in the paint and varnish industry
- also used in pharmaceuticals, insecticides, synthetic lubricants, and as plasticizers.

PHENOL

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure ($25^{o}C$) -	1.64 mm Hg @ 40.1 C
Chemical Formula -	C_6H_5OH
Molecular Weight -	94.1
Boiling Point -	181.8 C
Melting Point -	43 C
Solubility in Water -	Soluble

Additional Information -

- synonyms: carbolic acid, hydrobenzene, phenic acid, phenylic acid, benzophenol
- white crystalline solid. Acquires red color when exposed to air and light. Absorbs water
- sharp burning taste; characteristic sweet odor
- very soluble in alcohol and common organic solvents

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	3	3
Acute Systemic -	3	
Chronic Local -		2
Chronic Systemic -	2	

Additional Information -

- a protoplasmic, systemic poison. Very irritant to tissue. Very readily absorbed through the skin

Acute Poisoning

- main effect is on central nervous system. Absorption via skin can be fatal. Where death is delayed, damage to kidneys, liver, pancreas, spleen, and pulmonary edema may result.

Chronic Poisoning

- causes digestive disturbances, nervous disorders and skin erruptions. May cause damage to kidneys and liver
- causes dermatitis - stated to be a cocarcinogen

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 100 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 5 ppm; 19000 ug/m^3
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany (skin)	5	19000
Sweden (skin)	5	19000

D. Additional Information:

- U.S. TLV of 5 ppm adopted to prevent systemic effects via inhalation
- Soviet TLV (1967) 1 ppm
- Czechoslovakia TLV (1969) 5 ppm

IV COMMENTS

- used in manufacture of phenolic and epoxy resins, various organic chemicals, paint and varnish, pharmaceuticals, and pesticides.

PHOSGENE

I PROPERTIES

Physical State (ambient temp.) -	L or G
Vapour Pressure (25°C) -	1180 mm at 20C
Chemical Formula -	$COCl_2$
Molecular Weight -	98.92
Boiling Point -	8.2 C
Melting Point -	-128 C
Solubility in Water -	Slightly Soluble

Additional Information -

- Synonyms: Carbonyl Chloride; Carbon Oxychloride; Chloroformyl Chloride; CG
- Colorless gas, or colorless volatile liquid
- Strong, suffocating odor, especially when concentrated
- Soluble in benzene, toluene, acetic acid and most liquid hydrocarbons. Hydrolyzed slowly by water to form HCl and CO.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	3	3
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -		

Additional Information -

- the decomposition in lungs of phosgene to HCl (and CO) results in pulmonary edema, pneumonia, and lung abscess
- inhalation of high concentrations may be quickly fatal
- concentrations of 3-5 ppm cause irritation of eyes and throat. However, irritation is not immediate, even in fatal concentrations, giving no immediate warning that dangerous concentrations are being inhaled.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 130 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 0.05 ppm; 200 ug/m^3

(Over 8 Hcurs) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	0.1	400
Sweden	0.05	200

D. Additional Information:

- U.S. TLV of 0.05 ppm is based on human response
- Soviet TLV (1959) 0.1 ppm
- Czechoslovakia TLV (1969) 0.1 ppm

IV COMMENTS

- used in organic synthesis, especially of isocyanates, polyurethane and polycarbonate resins, carbamates, organic carbonates and chloroformates
- used in manufacture of pesticides, herbicides, and dyes.

PHOSPHINE

I PROPERTIES

Physical State (ambient temp.) -	G
Vapour Pressure (25^{o}C) -	
Chemical Formula -	PH_3
Molecular Weight -	34.04
Boiling Point -	-85 C
Melting Point -	-133.5 C
Solubility in Water -	Slightly Soluble

Additional Information -

- Synonym: Hydrogen Phosphide
- Colorless gas; disagreeable, garlic-like odor
- soluble in alcohol and ether

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	2	2
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -	3	

Additional Information -

- toxic action has not been fully determined. It appears to cause a depression of the central nervous system, and irritation of the lungs. It may also cause pulmonary edema.
- continued exposure to very low concentrations causes anemia, bronchitis, gastrointestinal disturbances, and visual, speech, and motor disturbances
- acute exposures lead to convulsions, coma, and death.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 0.3 ppm; 400 ug/m^3
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	0.1	150
Sweden	0.3	400

D. Additional Information:

- Soviet TLV (1967) and Czechoslovakia TLV (1969): 0.07 ppm

IV COMMENTS

- used in preparation of various organic compounds
- doping agent for solid state electronic components.

PHOSPHORIC ACID

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^{o}C) -	.0285 mm Hg @ 20 C
Chemical Formula -	H_3PO_4
Molecular Weight -	98.0
Boiling Point -	
Melting Point -	42.4 C
Solubility in Water -	Very Soluble

Additional Information -

- Synonym: Orthophosphoric Acid
- Clear, colorless, odorless liquid or transparent crystalline solid, depending on concentration and temperature
- soluble in alcohol. Corrosive to ferrous metals and alloys.
- forms para- and meta- phosphoric acids upon heating to 200 C

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -	2	
Chronic Local -	2	2
Chronic Systemic -		

Additional Information -

- irritant to eyes and skin
- much less harmful than nitric or sulfuric acid

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 100 ug/m^3 (as P_2O_5)

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 1000 ug/m^3
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

IV COMMENTS

- about 80% of total production is converted into calcium phosphate and ammonium phosphate for fertilizer
- another major use is production of sodium and potassium phosphates for use in detergents and cleaning compounds
- acid used for pickling and rust proofing of metals
- phosphates included in many other products

PHOSPHORUS (white or yellow)

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^{o}C) -	0.0388 mm Hg
Chemical Formula -	P_4
Molecular Weight -	123.9
Boiling Point -	280 C
Melting Point -	44.1 C
Solubility in Water -	Insoluble

Additional Information -

- Crystalline, transparent, wax-like solid; non-metallic; colorless to yellow
- occurs in 3 allotropic forms: white (or yellow), red, and black
- Insoluble in alcohol. Soluble in some organic solvents (benzene, CS_2, etc.) and oils
- darkens on exposure to light. Exhibits phosphorescence at room temperature

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		3
Acute Systemic -	3	
Chronic Local -		
Chronic Systemic -	3	

Additional Information -

- white phosphorus is most toxic allotrope
- vapors (evolved on burning) are irritative to nose, throat and lungs, eyes, skin, and mucous membranes
- can be absorbed via lungs. Has an acute effect on liver
- prolonged, low-level exposure causes damage to bones, particularly the jaw. Also severe effect on teeth
- airborne phosphorus can damage eyes severely

PHOSPHORUS (white or yellow)(2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 100 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany 100 ug/m^3

Sweden

D. Additional Information:

- U.S. TLV of 100 ug/m^3 adopted on basis of human response
- Soviet (1967) and Czechoslovakia (1969) TLV: 30 ug/m^3

IV COMMENTS

- the major consumers of phosphorus are as follows(with percentages of total production):

  - Detergent Phosphates: 50% (likely to change)
  - Liquid Fertilizers: 14%
  - Food, water treatment, pharmaceuticals, various chemicals: 16%
  - Alloys, pyrotechnics, fuel additives, pesticides, plasticizers: 20%

PHTHALIC ANHYDRIDE

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^oC) -	1.0 mm Hg @ 96.5 C
Chemical Formula -	$C_6H_4CO_2CO$
Molecular Weight -	148.1
Boiling Point -	295.1 C
Melting Point -	131.2 C
Solubility in Water -	Slightly Soluble

Additional Information -

- Synonym: Phthalandione
- white crystalline needles; mild odor
- sublimes readily
- soluble in alcohol

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		1
Acute Systemic -	1	
Chronic Local -	1	1
Chronic Systemic -		

Additional Information -

- skin, eye, and upper respiratory irritant
- exposed workers have developed chronic eye inflammation, chronic bronchitis, and emphysema
- also a skin sensitizer, and can cause allergic reactions

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 100 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 1 ppm; 6000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany		5000
Sweden	2	12000

D. Additional Information:

- Soviet TLV (1967) 0.2 ppm
- Czechoslovakia TLV (1969) 1 ppm

IV COMMENTS

- used in manufacturing of plastics, resins, paints, varnishes, pesticides, pharmaceuticals, and medicines.

β - PROPIOLACTONE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^oC) -	
Chemical Formula -	$\overline{OCH_2CH_2CO}$
Molecular Weight -	72.1
Boiling Point -	155 C
Melting Point -	- 33.4 C
Solubility in Water -	Soluble

Additional Information -

- Synonyms: 2- Oxetanone; Betaprone; Hydracrylic Acid β-Lactone; 3 - Hydroxypropionic Acid Lactone; 2- Oxetanone; Propanolide; Propiolactone; β - propionolactone; β - proprolactone; Propionic Acid 3 Hydroxy β- Lactone
- Colorless liquid; pungent odor
- Soluble in alcohol and organic solvents
- slowly hydrolyzed to hydrocrylic acid

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		3
Acute Systemic -	3	
Chronic Local -		3
Chronic Systemic -		

Additional Information -

- a strong irritant. Most toxic of the lactones
- has produced skin cancer in experimental animals
- recognized as a carcinogen by OSHA (U.S.), Germany, Sweden

β - PROPIOLACTONE (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- U.S. Occupational Standard: Carcinogen

IV COMMENTS

- Used as an intermediate in organic synthesis
- medical use as a sterilizing agent for vaccines, plasma

RESORCINOL

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25°C) -	1 mm Hg at 108.4 C
Chemical Formula -	$C_6H_4(OH)_2$
Molecular Weight -	110.1
Boiling Point -	276.5 C
Melting Point -	110 C
Solubility in Water -	Soluble

Additional Information -

- Synonyms: 1,3 - benzenediol, Resorcin, m-Dihydroxybenzene
- white crystals; acquires pink color on exposure to air and light
- unpleasant sweet taste
- soluble in alcohol and common organic solvents
- belongs to Phenol class of aromatic organic compounds

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -	2	
Chronic Local -		2
Chronic Systemic -	2	

Additional Information -

- compare health effects to those of Phenol
- primarily a skin irritant. Can cause injury to eyes, and dermatitis
- can cause systemic effects by acting as a blood and nerve poison
- can be absorbed through the skin when in solution

RESORCINOL (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -	10 ppm; 45,000 ug/m^3
(Over 8 Hours) -	

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

IV COMMENTS

- pharmaceuticals and medicine, pigments and dry colors, plastics and synthetic resins, rubber.

SELENIUM AND SELENIUM COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P. 25C	B.P. C	M.P. C	Sol In H_2O
Selenium	Se	78.96	S		685	217	INSOL.
Diethyldithio-carbamate	$Se[SC(S)N(C_2H_5)_2]_4$	672.1	S				
Dioxide	SeO_2	110.96	S	0.15 (30C)		340-350 subl.	V.SOL
Selenous Acid	H_2SeO_3	128.97	S			decomp. 70	V.SOL
Selenites	*e.g.* $Na_2SeO_3.5H_2O$	263.01	S				SOL.
Hexafluoride	SeF_6	192.95	G		-34.5	-46.6	SOL

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -	2-3	
Chronic Local -		
Chronic Systemic -		

Additional Information -

- dust fumes of Se can cause serious irritation of eyes and respiratory tract
- suspected carcinogen of liver, thyroid
- inorganic selenium compounds cause dermatitis

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - Selenium: 20 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -	Se compounds:	200 ug/m^3(as Se)
(Over 8 Hours) -	Se hexafluoride:	.05ppm; 400 ug/m^3

C. Occupational Standards (TLV) Elsewhere:

		(ug/m^3)
West Germany	Se compounds:	100
Sweden	Se compounds:	100

D. Additional Information:

- U.S. TLV of 200 ug/m^3 for Se compounds is adopted to prevent systemic effects and minimize irritation of eyes and respiratory tract[3]
- Soviet TLV (1959) 100 ug/m^3

IV COMMENTS

- used in electronics industry, photographic industry, and in glass manufacture
- added to stainless steel and copper alloys to increase machinability

SODIUM CYANIDE

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure ($25^{o}C$) -	1 mm Hg @ 817 C
Chemical Formula -	Na CN
Molecular Weight -	49.0
Boiling Point -	1496 C
Melting Point -	563.7 C
Solubility in Water -	Soluble

Additional Information -

- white, crystalline powder
- slightly soluble in alcohol
- aqueous solutions strongly alkaline; decomposes rapidly on standing

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- non-toxic systemically
- prolonged, low-level exposure may cause loss of appetite weakness, nausea, and symptoms of irritation of upper respiratory tract and eyes.

SODIUM CYANIDE (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- U.S. Occupational Standard: 5000 ug/m^3 (time weighted average)

IV COMMENTS

- used in extraction of gold and silver from ores
- used in electroplating and treatment of metals
- used in production of hydrocyanic acid
- used in manufacture of pigments, dyes, insecticides

SODIUM FLUORIDE

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25^{o}C) -	1 mm Hg at 1077 C
Chemical Formula -	Na F
Molecular Weight -	42.0
Boiling Point -	1700 C
Melting Point -	993 C
Solubility in Water -	Soluble

Additional Information -

- Synonym: Villiaumite
- Clear, lustrous crystals or white powder

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		3
Acute Systemic -	3	
Chronic Local -		1
Chronic Systemic -	3	

Additional Information -

- highly toxic by inhalation or ingestion
- strong irritant to tissue

SODIUM FLUORIDE (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

	Total Fluorides
Point of Impingement (half-hour average) -	(APR-OCT) 8.6 ug/m^3 (OCT-APR) 17.2 ug/m^3
Average Concentration over 24 hours -	(APR-OCT) 1.72 ug/m^3 (OCT-APR) 3.44 ug/m^3

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

- U.S. Occupational Standard: 5500 ug/m^3 (time weighted average)

IV COMMENTS

- Used in fluoridation of water supplies, treatment of steel, wood preservative, insecticide, rodenticide, electroplating, chemical cleaning, glass manufacture.

STYRENE MONOMER

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25°C) -	7.21
Chemical Formula -	$C_6H_5CHCH_2$
Molecular Weight -	104.1
Boiling Point -	146 C
Melting Point -	-31 C
Solubility in Water -	Insoluble

Additional Information -

- Synonyms: Phenyl Ethylene, Vinylbenzene, Cinnamene
- Colorless Liquid: penetrating aromatic odor
- Soluble in alcohol and ether
- Readily undergoes polymerization when heated or exposed to light

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -	2	
Chronic Local -		
Chronic Systemic -	2	

Additional Information -

- can cause irritation and injury to eyes at vapor concentrations greater than 200 ppm
- toxic effects usually transient
- narcotic at high concentrations
- symptoms of "styrene sickness", after exposure to vapor or mist, include headache, fatigue, depression, stupor, and incoordination.

STYRENE MONOMER (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - **Tentative Design Standard: 400 ug/m^3**

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 100 ppm; 420000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	100	420000
Sweden	50	210000

D. Additional Information:

- U.S. TLV of 100 ppm is set on basis of human response
- American National Standards Institute TLV: 100 ppm
- U.S. OCCUPATIONAL STANDARD
  Time Weighted Average: 100 ppm
  Ceiling Value: 200 ppm
  Peak Value: 600 ppm (5 min/3 hours)

IV COMMENTS

- important intermediate in chemical synthesis. Widely used in manufacture of plastics, synthetic rubber, and resins.

SULFURIC ACID

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^oC) -	.000160 mm Hg
Chemical Formula -	H_2SO_4
Molecular Weight -	98.08
Boiling Point -	338 C
Melting Point -	10.36 C
Solubility in Water -	Very Soluble
Additional Information -	

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -	3	3
Acute Systemic -		
Chronic Local -	2	2
Chronic Systemic -		

Additional Information -

- prolonged inhalation may cause chronic bronchitis. Severe exposure may cause chemical pneumonitis
- inhalation of concentrated vapour can cause serious lung damage
- erosion of tooth enamel of acid plant workers has been reported
- fumes and mists cause coughing and irritation of mucous membranes of eyes and upper respiratory tract
- frequent skin contact causes dermatitis

SULFURIC ACID (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 100 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 1000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	ug/m^3
West Germany	1000
Sweden	1000

D. Additional Information:

- U.S. TLV of 1000 ug/m^3 is adopted to prevent irritation of respiratory passages and injury to teeth
- Soviet and Czechoslovokia TLV 1000 ug/m^3

IV COMMENTS

- about 42% used in manufacture of phosphate fertilizers, and 9% used in petroleum refining
- other uses include manufacture of $(NH_4)_2\ SO_4$ (6%), pigments (5%), explosives (3%)
- used in manufacturing of alcohol (2%), steel pickling (2%) uranium processing (2%), copper ore leaching (2%)
- for miscellaneous chemicals and various other uses (24%)

TELLURIUM AND TELLURIUM COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P.	B.P. C	M.P. C	Sol In H_2O
Tellurium	Te	127.6	S		990	450	INSOL.
Dioxide	TeO_2	159.6	S		1245	733	INSOL.
Hexafluoride	TeF_6	241.6	G			-37.6	SL.SOL
Tellurites	e.g. Na_2TeO_3	221.58	S				SL.SOL
Hydride	H_2Te	129.62	G		-2.2	-48.9	V.SOL

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -	2	
Chronic Local -		
Chronic Systemic -	2	

Additional Information -

- relatively low toxicity. Exposure leads to garlic like odor being imparted to breath, sweat.
- heavy exposures may result in headache, drowsiness, metallic taste, loss of appetite, nausea. Large doses can be fatal.
- the gaseous hexafluoride is highly toxic, as is the unstable hydrogen telluride

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

	Tentative Standard:
Point of Impingement (half-hour average) -	Tellurium: 30 ug/m^3 (all compounds as Te)
Average Concentration over 24 hours -	

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -	Tellurium:	100 ug/m^3
(Over 8 Hours) -	Tellurium Hexafluoride:	0.02 ppm 200 ug/m^3

C. Occupational Standards (TLV) Elsewhere:

West Germany Tellurium: 100 ug/m^3

Sweden

D. Additional Information:

- Soviet TLV (1967) for Tellurium: 10 ug/m^3

IV COMMENTS

- used as an additive to metals: lead, steels, copper
- used in rubber vulcanization; added to glass and ceramics as a coloring agent
- used in electronics industry

TETRACHLOROETHYLENE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^{o}C) -	17.8 mm Hg
Chemical Formula -	CCl_2CCl_2
Molecular Weight -	165.8
Boiling Point -	121.2 C
Melting Point -	-23.4 C
Solubility in Water -	Insoluble

Additional Information -

- Synonym: perchloroethylene, carbon dichloride
- colourless liquid
- odour like chloroform
- extremely stable chemically
- miscible with alcohol, ether and oils

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		2
Acute Systemic -	2	
Chronic Local -		2
Chronic Systemic -	2	

Additional Information -

- irritant to eyes, skin and respiratory tract
- moderately toxic by skin absorption
- anesthesic affect upon the nervous system
- ingestion may cause damage to the gastrointestinal tract
- subject of current OSHA carcinogenesis inquiry

TETRACHLOROETHYLENE (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 100 ppm; 670000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	100	670000
Sweden	30	200000

D. Additional Information:

- Soviet TLV(1967)	7 ppm
- Czechoslovakia TLV(1969)	37ppm
- American National Standards Institute TLV(1967)	100ppm
- U.S. Occupational Standards	
Time Weighted Average:	100ppm
Ceiling value:	200ppm
Peak value:	300ppm (5 min/3hours)

IV COMMENTS

- dry cleaning solvent
- vapour-degreasing solvent
- drying agent for metals

TITANIUM DIOXIDE

I PROPERTIES

Physical State (ambient temp.) -	S
Vapour Pressure (25°C) -	
Chemical Formula -	TiO_2
Molecular Weight -	79.90
Boiling Point -	
Melting Point -	1860 C (decomposes)
Solubility in Water -	Insoluble

Additional Information -

- Synonyms: Titanic Anhydride; Titanic Acid Anhydride; Titanic Oxide; Titanium White; Rutile
- white to black powder depending on purity

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- Generally regarded as a nuisance dust
- very high concentrations may cause irritation of the respiratory tract

2...

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - Titanium Compounds 100 ug/m^3 (as Ti)

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 10000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

IV COMMENTS

- TiO_2 is the principal white pigment of commerce. Consumption is as follows (with percentages of total production):

Paints	60%
Paper	14%
Plastics	12%
Printing Inks	3%

- remaining uses include rubber, ceramics, and textiles.

TOLUENE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^{o}C) -	26.8 mm Hg
Chemical Formula -	$CH_3C_6H_5$
Molecular Weight -	92.15
Boiling Point -	110.7 C
Melting Point -	-94.5 C
Solubility in Water -	Insoluble

Additional Information -

- Synonyms: Methylbenzene, Phenylmethane, Toluol
- Colorless liquid; benzene-like odor
- Soluble in alcohol, ether, chloroform and many organic liquids
- Chemically, behaves much like benzene

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		1
Acute Systemic -	2	
Chronic Local -		1
Chronic Systemic -	2	

Additional Information -

- narcotic in high concentrations
- chronic, low-level exposures may cause anemia. However much less toxic than benzene. No bone marrow injury as with benzene.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 2000 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 100 ppm; 375000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany (skin)	200	750000
Sweden (skin)	100	375000

D. Additional Information:

- U.S. TLV of 100 ppm is set on basis of irritative and narcotic effects observed in workers exposed at concentrations of 200 ppm or higher.
- Soviet TLV (1967) 14 ppm
- Czechoslovokia TLV (1969) 50 ppm
- American National Standards Institute TLV (1967) 200 ppm
- U.S. Occupational Standard, time weighted average: 200 ppm
  Ceiling Value 300 ppm
  Peak Value: 500 ppm (10 min.)

IV COMMENTS

- about 50% is used as source of benzene
- used in synthesis of several organic compounds
- used in manufacture of phenol
- used as a solvent for many organic compounds

TOLUENE -2,4 - DIISOCYANATE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^oC) -	0.01 mm Hg at 20 C
Chemical Formula -	$CH_3C_6H_3\ (NCO)_2$
Molecular Weight -	174.16
Boiling Point -	251 C
Melting Point -	20 C
Solubility in Water -	Reacts with water.

Additional Information -

- Synonyms: TDI; 2,4 - Tolylene Diisocyanate, meta-tolylene diisocyanate
- clear, faintly yellow liquid ; darkens on exposure to sunlight
- sharp, pungent odor
- reacts with water producing CO_2
- soluble in ether, acetone, and other organic solvents.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		3
Acute Systemic -	3	
Chronic Local -		3
Chronic Systemic -		

Additional Information -

- highly toxic by ingestion and inhalation
- particularly irritating to eyes. Also irritating to skin and respiratory tract
- capable of producing severe dermatitis. Also severe bronchial spasms.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 1.0 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value -(ceiling)0.02 ppm; 120 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany(ceiling)	0.02	140
Sweden (ceiling)	0.01	70

D. Additional Information:

- Soviet TLV (1967) 0.07 ppm

IV COMMENTS

- used in the manufacture of polyurethane foams and other elastomers

1,1,1 - TRICHLOROETHANE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25°C) -	120 mm Hg
Chemical Formula -	CH_3CCl_3
Molecular Weight -	133.4
Boiling Point -	74.1 C
Melting Point -	- 32.5 C
Solubility in Water -	Insoluble

Additional Information -

- Synonyms: α - trichloroethane, methyl chloroform
- colourless liquid
- soluble in alcohol, benzene, and acetone

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		1
Acute Systemic -	2	
Chronic Local -		1
Chronic Systemic -	1	

Additional Information -

- narcotic effect in high concentration
- less toxic than carbon tetrachloride
- subject of current OSHA carcinogenesis inquiry

1,1,1 - Trichloroethane (2)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 350 ppm; 1,900,000 ug/m^3
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	200	1,080,000
Sweden	100	540,000

D. Additional Information:

IV COMMENTS

- solvent for cleaning precision instruments
- aerosol propellant
- metal degreasing
- pesticide

TRICHLOROETHYLENE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^oC) -	72.4 mm Hg
Chemical Formula -	$CHClCCl_2$
Molecular Weight -	131.4
Boiling Point -	87.1 C
Melting Point -	-73 C
Solubility in Water -	Slightly Soluble

Additional Information -

- Synonyms: Ethylene or Ethinyl Trichloride
- Colorless, heavy, mobile liquid; chloroform-like odor
- miscible with common organic liquids

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		1
Acute Systemic -	3	
Chronic Local -		1
Chronic Systemic -	1	

Additional Information -

- inhalation of high concentrations causes narcosis and anesthesia. Death following severe exposure is attributed to cardiac failure.
- prolonged inhalation of moderate concentrations causes headaches and drowsiness
- possibly some damage to liver and other organs.
- subject of current OSHA carcinogenic inquiry
- found to be carcinogenic in some animal experiments
- subject of current OSHA carcinogenesis inquiry

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 85000 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 100 ppm; 535000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	50	260000
Sweden	30	160000

D. Additional Information:

- U.S. TLV of 100 ppm is set on basis of human response
- Soviet TLV (1967) 2 ppm
- Czechoslovakia TLV (1969) 45 ppm
- American National Standards Institute TLV (1967) 100 ppm
- U.S. Occupational Standard: time weighted average 100 ppm
  Ceiling Value: 200 ppm
  Peak Value: 300 ppm (5 min/2hour)

IV COMMENTS

- About 95% is used as solvent in vapor degreasing applications
- Also used as extraction solvent for fats, oils, waxes, in dry cleaning operations, organic compound synthesis, and as an anaesthetic.

VANADIUM AND VANADIUM COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P.	B.P. C	M.P. C	Sol In H_2O
Vanadium	V	50.94	S		3000	1717	INSOL.
Pentoxide	V_2O_5	181.90	S		decomp 1750	690	SOL.
Trioxide	V_2O_3	149.90	S			1940	INSOL.

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- Vanadium compounds act as irritants to eyes and respiratory tract
- Pentavalent compounds (V_2O_5, vanadates) are more toxic than other forms
- inhalation of V_2O_5 affects the respiratory passages. Tracheitis, bronchitis, emphysema, pulmonary edema, and bronchial pneumonia may occur.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - all forms: 5.0 ug/m^3 (as V)

Average Concentration over 24 hours - 2.0 ug/m^3

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - Vanadium Pentoxide (as V)
(Over 8 Hours) - Dust: 500 ug/m^3
Fume: 50 ug/m^3

C. Occupational Standards (TLV) Elsewhere:

	Vanadium Pentoxide	ug/m^3
West Germany	Dust:	500
	Fume:	100
Sweden	Dust:	500
	Fume:	50

D. Additional Information:

IV COMMENTS

- Consumption of vanadium is largely in form of Ferrovanadium for manufacture of steels.

VINYL ACETATE MONOMER

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure (25^{o}C) -	107.5 mm Hg
Chemical Formula -	$CH_3COOCHCH_2$
Molecular Weight -	86.1
Boiling Point -	73 C
Melting Point -	-100 C
Solubility in Water -	Insoluble

Additional Information -

- colorless mobile liquid. Polymerizes to colorless, transparent, solid on exposure to light
- Soluble in most organic solvents, including chlorinated solvents
- Usually contains an inhibitor such as hydroquinone

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		1
Acute Systemic -	1	
Chronic Local -		1
Chronic Systemic -		

Additional Information -

- skin and eye irritant. Can cause allergic response in skin
- high concentrations may be narcotic
- from industrial experience, prolonged exposures to low concentrations (5-10 ppm) do not produce chronic effects
- animal experiments show low toxicity

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) -

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 10 ppm; 30000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m^3)
West Germany	10	30000
Sweden		

D. Additional Information:

IV COMMENTS

- raw material for polyvinyl acetate

VINYLIDENE CHLORIDE

I PROPERTIES

Physical State (ambient temp.) -	L
Vapour Pressure ($25^{o}C$) -	630 mm Hg
Chemical Formula -	CH_2CCl_2
Molecular Weight -	97.0
Boiling Point -	31.6 C
Melting Point -	-122 C
Solubility in Water -	Insoluble

Additional Information -

- Synonyms: 1,1-Dichloroethylene
- Colorless, volatile liquid. Mild, sweet odor
- Soluble in organic solvents

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- irritant to skin and mucous membranes
- narcotic in high concentrations
- has caused liver and kidney injury in experimental animals
- subject of current OSHA carcinogenesis inquiry

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - 26,000 ug/m^3

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - 10 ppm; 40,000 ug/m^3

(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

West Germany

Sweden

D. Additional Information:

IV COMMENTS

- intermediate in production of vinylidene polymer plastics (Saran, Velon)
- Also used in adhesives. Component of synthetic fibers.

XYLENES

I PROPERTIES

	meta	ortho	para
Physical State (ambient temp.) -		Liquid	
Vapour Pressure (25^{o}C) - mm Hg	8.04	6.55	8.55
Chemical Formula -	$C_6H_4 (CH_3)_2$		
Molecular Weight -		106.2	
Boiling Point -	139 C	144 C	138 C
Melting Point -	-47.9 C	-25.2 C	13.3 C
Solubility in Water -		Insoluble	

Additional Information -

- Synonyms: m-, o-, p-xylol
- Colorless liquid or white crystalline solid
- Soluble in alcohol, ether, and many organic solvents
- Commercial xylene is a mixture of 3 isomers. Meta and para form usually predominate

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		1
Acute Systemic -	2	
Chronic Local -		1
Chronic Systemic -	2	

Additional Information -

- may be narcotic at high concentrations. High concentrations (200 ppm) also cause irritation to eyes, nose, and throat
- gastrointestinal, neurological disturbances, injury to heart, liver, kidneys, nervous system found among xylene workers. But chronic toxicity not well-defined due to benzene as an impurity in commercial xylene. Xylene is less toxic than benzene.

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - $2300\ ug/m^3$

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (skin) 100 ppm; $435000\ ug/m^3$
(Over 8 Hours) -

C. Occupational Standards (TLV) Elsewhere:

	(ppm)	(ug/m3)
West Germany (skin)	200	870,000
Sweden (skin)	100	435,000

D. Additional Information:

- U.S. TLV of 100 ppm is adopted to prevent irritant and narcotic effects
- Soviet TLV (1967) 11 ppm
- Czechoslovokia TLV (1969) 45 ppm
- American National Standards Institute TLV(1970) 100 ppm

IV COMMENTS

- used in synthesis of organic chemicals. Also in manufacture of pesticides, dyes, pharmaceuticals,
- used in non-leaded automobile fuels
- used as solvent for resins, enamels etc.

ZINC AND ZINC COMPOUNDS

I PROPERTIES

Compound	Formula	Mol. wt.	P st.	V.P.	B.P. C	M.P. C	Sol In H_2O
Zinc	Zn	65.37	S		907	419	
Acetate	$Zn(C_2H_3O_2)_2$	183.46	S		decomp. 200		V.SOL.
Ammonium Bisulphite							
Ammonium Chloride							
Chloride	$ZnCl_2$	136.28	S		732	283	V. SOL.
Chromate	$ZnCrO_4$	181.36	S				INSOL.
Dibutyldithio-carbamate	$Zn[SC(S)N(C_4H_9)_2]_2$	474.2	S			104	
Diethyl "	$Zn[SC(S)N(C_2H_5)_2]_2$	361.9					
Dust	Zn	65.37	S		907	419.4	INSOL.
2-Ethylhexoate							
Hydrosulphite	$ZnSO_3.2H_2O$	181.46	S		dissoc. 200		SOL.
Isodecanoate	$Zn(C_{12}H_{23}O_2)_2$	464.00	S			128	SL.SOL.
Lignosulphonates							
Mercaptobenzothiazole							
Naphthenates	$Zn(C_6H_5COO)_2$	319.7					
Neodecanoate							
Nitrate, trihydrate	$Zn(NO_3)_2.3H_2O$	243.43				45.5	V.SOL.
Oxide	ZnO	81.37				1975	SL.SOL.
Peroxide	$ZnO_2.$ 1/2 H_2O	106.38					DISSOC.
Selenide	ZnSe	144.33				> 1100	INSOL.
Stearate	$Zn(C_{18}H_{35}\ O_2)$	632.33				130	INSOL
Sulphate	$ZnSO_4$	161.43				dissoc. 600	SOL.
Tallate	Salt of tall oil mixture of rosin acids and fatty acids.						

II HEALTH EFFECTS (see Toxic Hazard Rating Code):

	Inhalation	Irritant
Acute Local -		
Acute Systemic -		
Chronic Local -		
Chronic Systemic -		

Additional Information -

- inhalation of zinc oxide fume may cause metal fume fever. But quick recovery generally occurs
- zinc chloride fume can cause damage to mucous membranes of respiratory tract. Inhalation may produce severe pneumonitis. It is caustic and can cause ulceration of skin
- several zinc compounds are suspected carcinogens (Dibutyl and Dimethyldith ocarbonate, chromate pigments)

III OCCUPATIONAL AND ENVIRONMENTAL AIR STANDARDS:

A. Ontario Environmental Air Standards:

Point of Impingement (half-hour average) - all forms: 100 ug/m^3 (as Zn)

Average Concentration over 24 hours -

B. Ontario Occupational Health Guidelines:

Threshold Limit Value - (Over 8 Hours) -

Zinc chloride fume:	1000 ug/m^3
Zinc oxide fume:	5000 ug/m^3
Zinc Stearate:	10000 ug/m^3

C. Occupational Standards (TLV) Elsewhere:

		ug/m^3
West Germany	Zinc Oxide Fume:	5000
Sweden	Zinc Oxide Fume:	5000
	Zinc Chloride Fume:	1000

D. Additional Information:

- Soviet TLV (1967) and Czechoslovakia TLV(1969) for ZnO fume: 5000 ug/m^3

05.06 Explanatory Notes for Hazardous Substances Handbook

Section 05.01

Hazardous Substances List

All substances on the Hazardous Substances List (HASL) are considered capable of adversely affecting human health when encountered in the atmospheric environment at low to moderate dose levels (expected environmental doses).

Changes in the Hazardous Substances List will be communicated periodically to all parties on this report's mailing list. These communications will probably be in the form of revised pages which are to be inserted in the Handbook (sections 05.01) to replace outdated versions of the HASL. All changes in HASL will be dated.

Category A Compounds:

The substances in this category are judged capable of causing irreversible acute response or chronic illness as a result of a single or brief exposure to a relatively small quantity (low dose). These substances should be considered of highest priority.

Category B Compounds:

The substances in this category are considered capable of causing chronic health effects as a result of exposure to a low concentration (typical of environmental exposure) over a long period of time. These substances should be considered high priority.

Carcinogens:

This subgroup within Category B consists of substances which are officially recognized by the U.S. Occupational Safety and Health Administration (OSHA) to be carcinogenic in man.

Category C Compounds:

The substances in this category have moderate to high acute (single or brief large dose) inhalation toxicity, but low chronic inhalation toxicity or short atmospheric persistence.

Section 05.02

Chemical Usage Identified by Industrial Sector

The Industrial Sector Table is drawn up from a 1974 Environment Canada report prepared by James F. MacLaren Limited (Reference 2 of section 05.05). The usage data is up-to-date information (1970) obtained from Statistics Canada reports. A number of compounds have been added to include all substances on HASL as well as a few related compounds.

Section 05.03

Hazardous Substances Data Base Compilation

The Data Base Table is taken in its entirety from the 1976 ARB report prepared by James F. MacLaren Limited (Reference 1 of section 05.05). It contains toxicity data and general information on some 2500 industrial chemicals known or supposed to be used in Ontario. The usage data is up-to-date information (1970) obtained from Statistics Canada reports. This table was the starting point from which HASL was drawn up.

The references listed at the beginning of this section indicate the literature sources used in compiling the Data Base Table.

Section 05.04

Ongoing Priority Substances

This section contains brief summaries on "common" or well-known pollutants which are currently under investigation by the Technology Development and Appraisal Section of ARB. Detailed emission inventory data have been gathered or are in

the process of being gathered. In some cases, detailed reports have been published.

Each summary is self-contained; each summary has its own list of references. The summaries are in alphabetical order and they are not numbered. With this format, additional summaries on other substances could be added periodically.

Section 05.05

Hazardous Substances Data Sheets

The references listed at the beginning of this section indicate the literature sources used in compiling the Data Sheets. The references are grouped under the appropriate sections of the Data Sheets.

The Data Sheets are in alphabetical order. The individual pages are not numbered. With this format, additional Data Sheets on other substances could be added periodically.

I Properties:

All temperatures are given in degrees centigrade. Vapor pressures (V.P.) are given in millimeters (mm) of Hg. Unless otherwise specified, vapor pressures are values at 25 C.

Wherever possible, a description is given of the characteristic odor of substances. More quantitative odor information is given in the Data Base Table (Section 05.03) for a number of substances, in terms of odor threshold values. It should be noted that the values which are quoted in the Data Base Table (section 05.03) represent the lowest values found in the literature.

Unless otherwise indicated, the melting and boiling points which are given are values at 760 mm Hg.

Solubilities in water are expressed as follows: insoluble (insol.), slightly soluble (sl. sol.), soluble (sol.), and very soluble (V. sol.).

Abbreviations:

P. St.:	physical state				
S:	solid	L:	liquid	G:	gas
V.P:	vapor pressure				
M.P.:	melting point	B.P :	boiling point		
decomp:	decomposes				
subl:	sublimes				
atms:	atmosphere				
p-:	para	m-:	meta	O-:	ortho

II Health Effects:

The Toxic Hazard Rating (THR) is given to indicate the relative toxicity of different substances, and is defined elsewhere in the handbook. The THR code is used by Sax (Reference 8 of section 05.05) to describe toxicity by various routes of exposure including inhalation, ingestion, skin absorption, irritation. However, only the inhalation and irritation toxicities are given.

In order to be more accessible to the general reader, the discussion on health effects avoids detailed medical terminology and is deliberately descriptive rather than precise. Furthermore the emphasis is on health effects arising from exposure to the substances in the atmospheric environment.

Substances are referred to as human carcinogens only if they are officially recognized as such by the United States (OSHA, ACGIH), West Germany, and Sweden. All other references to carcinogenicity refer to experimental results in animal toxicity studies (by any or all routes of exposures).

III Occupational and Environmental Air Standards:

The Ontario Occupational Health Guidelines are identical (with only a few exceptions) to the U.S. Threshold Limit Values (TLV), drawn up by the American Conference of Governmental and Industrial Hygienists and adopted as interim standards by the U.S. Occupational Safety Health Administration.

Threshold Limit Values (TLV) refer to airborne, time-weighted average concentrations for a 8 or 10 hour work day and 40 hour work week. They represent conditions under which it is believed that nearly all workers may be repeatedly exposed daily without adverse effects.

The "Skin" notation does not mean that the only effects of a specific substance are on the skin. The notation refers to the fact that, in addition to effects produced by inhalation, there is the possibility that contact with the skin (including mucous membranes and eyes) either by airborne or direct contact, will lead to additional exposure. Furthermore, with this additional exposure, the total exposure may greatly exceed the TLV which is only designed for airborne concentrations.

Substances with a "Ceiling" designation on the TLV are invariably "fast-acting". The Ceiling value represents a boundary beyond which the concentrations should not be allowed to exceed. By contrast, time weighted averages permit brief excursions above the limit.

The Swedish TLV's are time weighted averages (like the U.S. values). The West German TLV's are maximum permissable concentrations, although brief excursions over the limit are permitted.

Where possible, the basis on which the U.S. TLV is established is given. In most cases, protection against impairment of human health is the primary consideration.

The U.S. Occupational Standards refer to the standards promulgated under the U.S. Occupational Safety and Health Act of 1970. The standards may be expressed in terms of time-weighted averages, ceiling values, and peak values. The U.S. Occupational Standard is given only if it is different from the U.S. TLV.